ENVIRONMENTAL MONITORING

Pathway Monitoring

The effluent and environmental monitoring program provides data on surface waters, soils, sediments, food and produce, and on the effluent air and liquids that could provide pathways for the movement of radionuclides or hazardous substances from the West Valley Demonstration Project (WVDP) to the public. Both radiological and nonradiological parameters are monitored in order to ascertain the effect of Project activities.

Stream sediments are sampled upstream and downstream of the WVDP. The food pathway is monitored by collecting samples of beef, hay, milk, and produce at both near-site and remote locations, samples of fish upstream and downstream of the site, and venison samples from the near-site deer herd and from background locations. Direct radiation on-site, at the perimeter of the site, in communities near the site, and at background locations is also monitored to provide additional data.

The radionuclides present at the WVDP site are residues from the reprocessing of commercial nuclear fuel during the 1960s and early 1970s. A very small fraction of these radionuclides is released off-site during the year through ventilation systems and liquid discharges and makes a negligible contribution to the radiation dose to the surrounding population through a variety of exposure pathways. (See Chapter 4, Table 4-2 [p.4-7].)

The primary focus of the monitoring program, however, is on air and surface water pathways, as these are the primary means of transport of radionuclides from the site.

Air and Water Pathways

Air and liquid effluents are monitored on-site by collecting samples at locations where radioactivity or other regulated substances are released or might be released. These include plant ventilation stacks and water effluent outfalls.

Surface water samples are collected from the tributaries of Cattaraugus Creek that flow through the Western New York Nuclear Service Center (WNYNSC) and from drainage channels within the Project site.

Both air and water samples are collected at site perimeter locations where the highest off-site concentrations of transported radionuclides might be

expected. Samples also are collected at remote locations to provide background concentration data.

Sampling Codes

The complete environmental monitoring schedule and maps are located in *Appendix A* (pp. A-i through A-53). This schedule provides information on monitoring and reporting requirements and the types and extent of sampling and monitoring at each location. An explanation of the codes that identify the sample medium and the specific sampling or monitoring location is also found in *Appendix A* (p. A-iii). For example, a sample location code such as AFGRVAL indicates an air sample (A), off-site (F), at the Great Valley (GRVAL) sampling station. These codes are used throughout this report for ease of reference and to be consistent with the data reported in the appendices.

Air Sampler Location and Operation

Air samplers are located at points remote from the WVDP, at the perimeter of the site, and on the site itself. Figure 2-1 (p. 2-4) shows the locations of the on-site air effluent monitors and samplers and the on-site ambient air samplers; Figure 2-2 (p. 2-5) and Figure A-9 in *Appendix A* (p. A-53) show the locations of the perimeter and remote air samplers, respectively.

Air samples are collected by drawing air through a very fine filter with a vacuum pump. The total volume of air drawn through the filter is measured and recorded. The filter traps particles of dust that are then tested in the laboratory for radioactivity. At the Rock Springs Road, Great Valley, and New York State-licensed disposal area (SDA) ambient air sampling locations, samples also are collected for iodine-129 and tritium analyses. (A more detailed description of the air sampling program follows below.)

Water Sampler Location and Operation

Automatic samplers collect surface water at points along drainage channels within the WNYNSC that are most likely to show any radioactivity released from the site and at a background station upstream of the site. (Grab samples are collected at several other surface water locations both on- and off-site.) Figure 2-3 (p. 2-6) shows the locations of the on-site surface water monitoring points. (On-site automatic samplers operate at locations WNSP006, WNNDADR,WNSW74A, and WNSWAMP.) Figure 2-4 (p. 2-7) shows the location of the off-site surface water monitoring points. (Off-site automatic samplers are at WFBCTCB, WFFELBR, and the background location, WFBCBKG.)

Radiological Monitoring

Surface Water and Sediment Monitoring

On-site Surface Water Sampling

A map of on-site surface water sampling locations is found on Figure 2-3 (p. 2-6).

Low-level Waste Treatment Facility Sampling Location

The largest single source of radioactivity released to surface waters from the Project is the discharge from the low-level waste treatment facility through the lagoon 3 weir (WNSP001 on Fig. 2-3 [p. 2-6]) into Erdman Brook, a tributary of Frank's Creek. There were six batch releases totaling about 44.0 million liters (11.6 million gal) in 1997. In addition to composite samples collected near the beginning and end of each discharge, a total of thirty-nine effluent grab samples, one for each day of discharge, was collected and analyzed.

The total amounts of radioactivity from specific radionuclides in the lagoon 3 effluent are listed in *Appendix C-1*, Table C-1.1 (p.C1-3). The observed annual average concentration of each radionuclide released is divided by its corresponding Department of Energy derived concentration guide (DCG) in order to determine what percentage of the DCG was released. (DOE standards and DCGs for radionuclides of interest at the WVDP are found in *Appendix B* [p. B-3].) As a DOE policy, the sum of the percentages calculated for all radionuclides released should not exceed 100%. In 1997 the annual average isotopic concentrations from the lagoon 3 effluent discharge weir combined to be approximately 22% of the DCGs. (See *Appendix C-1*, Table C-1.2 [p. C1-4].)

The average radioactivity concentrations from 1994 to 1996 were 44%, 43%, and 35% of the DCG, respectively. The reduction from 44% to 22% over this period is mostly attributable to improved removal of strontium-90. The low-level waste treatment facility (LLWTF) is designed to most efficiently remove strontium-90 and cesium-137, the more prevalent of the long-lived fission products in WVDP waste waters. To a much lesser extent, other radionuclides are also removed by the LLWTF. For example, the other major contributor to the total combined DCG is uranium-232, which averaged 11.9% of its DCG in 1997, or about 9% lower than its average concentration in 1996. Uranium-232 and other uranium isotopes are common in WVDP liquid waste because they were present in the nuclear fuel that was once reprocessed at the site.

Variations in liquid effluent isotopic ratios continued to reflect the dynamic nature of the waste streams being processed through the low-level waste treatment facility (LLWTF) and of the process itself.

Frank's Creek Sampling Location

A water sampling station (WNSP006) is located on Frank's Creek where Project site drainage leaves the security-fenced area, more than 4.0 kilometers (2.5 mi.) from the nearest public access point. (See Fig. 2-3 [p. 2-6].) This sampler collects a 50-mL aliquot (a small volume of water) every half-hour. Samples are retrieved weekly and composited both monthly and quarterly. (Data are found in Table C-1.4 [p. C1-6].) Weekly samples are analyzed for tritium and gross alpha and beta radioactivity as well as pH and conductivity. The monthly composite is analyzed for strontium-90 and gamma-emitting isotopes. (See *Glossary*, "gamma isotopic.") A quarterly composite is analyzed for carbon-14, iodine-129, technetium-99, alpha-emitting radionuclides, and total uranium.

The highest monthly concentration of a beta-emitting radionuclide at WNSP006 was strontium-90 at 1.93E-08μCi/mL (0.71 Bq/L).This corresponds to 1.9% of the DCG for strontium-90. There was only one positive detection of cesium-137 (1.05E-08μCi/mL [0.39 Bq/L]) in 1997, and this value was very close to the analytical detection limit. The annual average concentration of cesium-137 at WNSP006 was less than 0.6% of the DCG, and the average strontium-90 concentration was 1.3% of the strontium-90 DCG. Tritium, at an annual average of 3.98E-07 μCi/mL (1.47E+01Bq/L), was 0.02% of the DCG value. The annual gross alpha average was less than 1.21E-09μCi/mL (4.47E-02 Bq/L), or less than 4.0% of the DCG for americium-241. The 1997 data are comparable to 1996 data.

The eleven-year trends of gross alpha, gross beta, and tritium concentrations at location WNSP006 are shown on Figure 2-5 (p.2-8).The long-term trend plot for WNSP006 is dominated by fluctuations related to treated WVDP liquid effluent

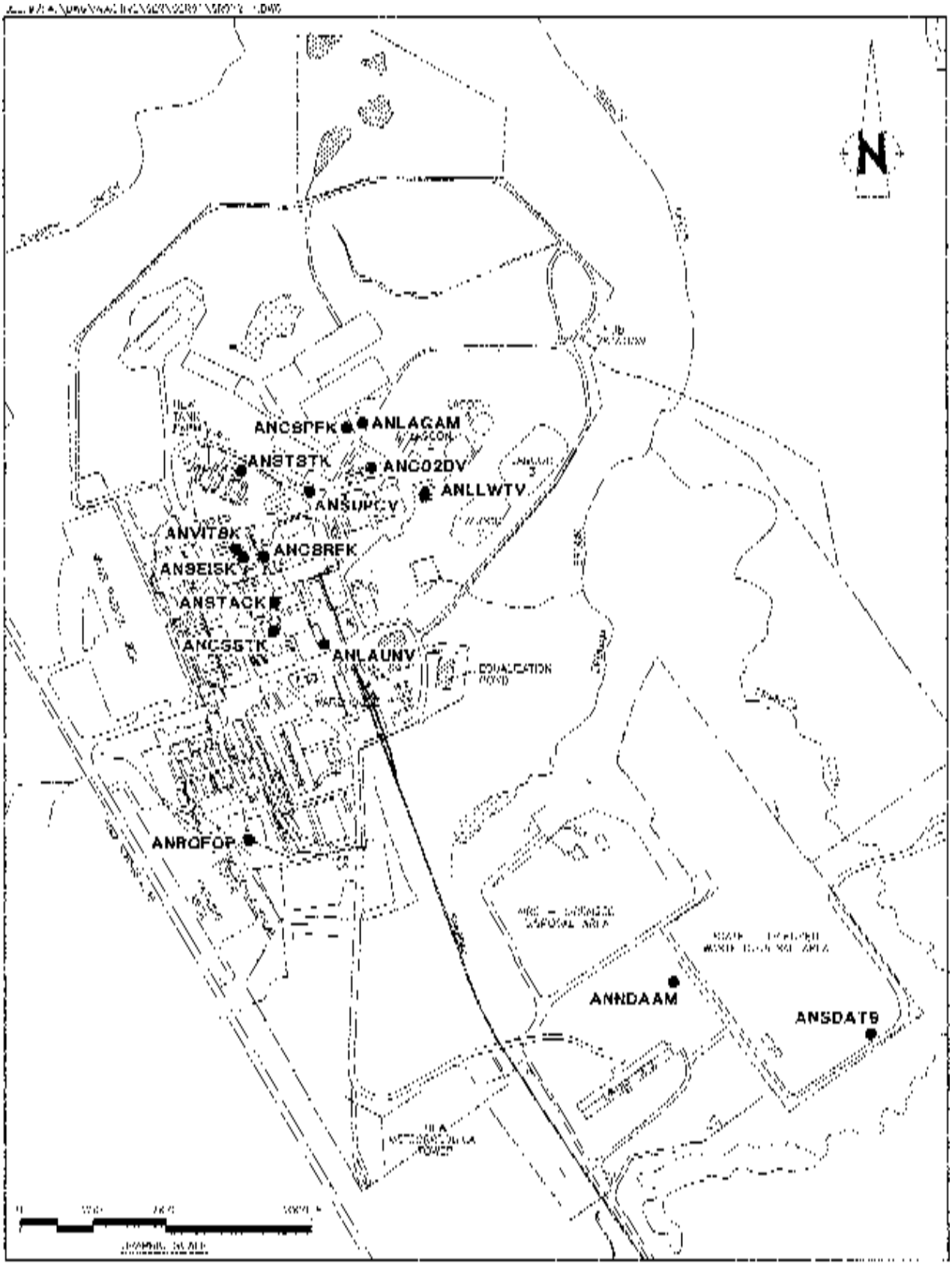

Figure 2 1. On site Air Monitoring and Sampling Points.

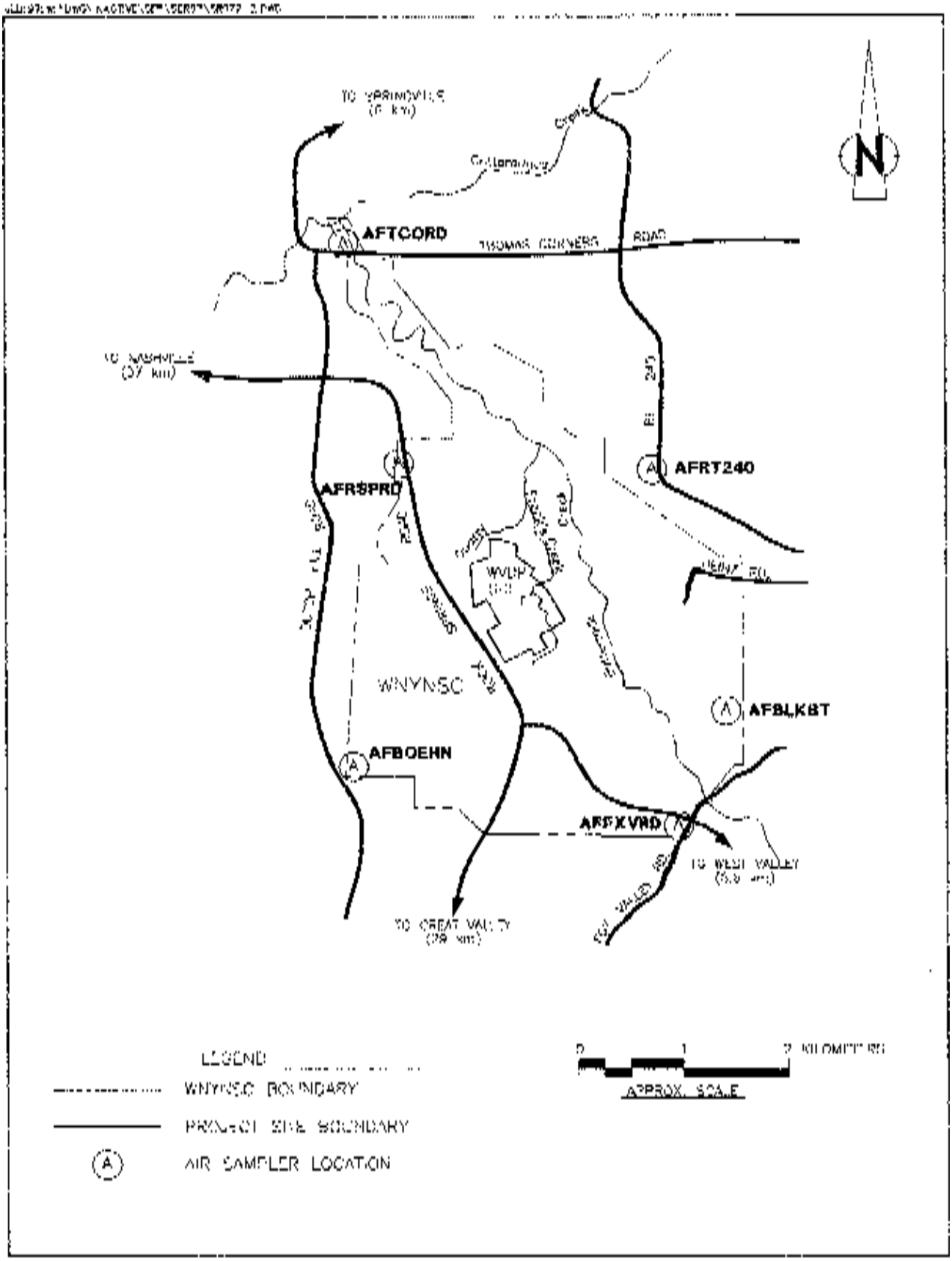

Figure 2-2. Location of Perimeter Air Samplers.

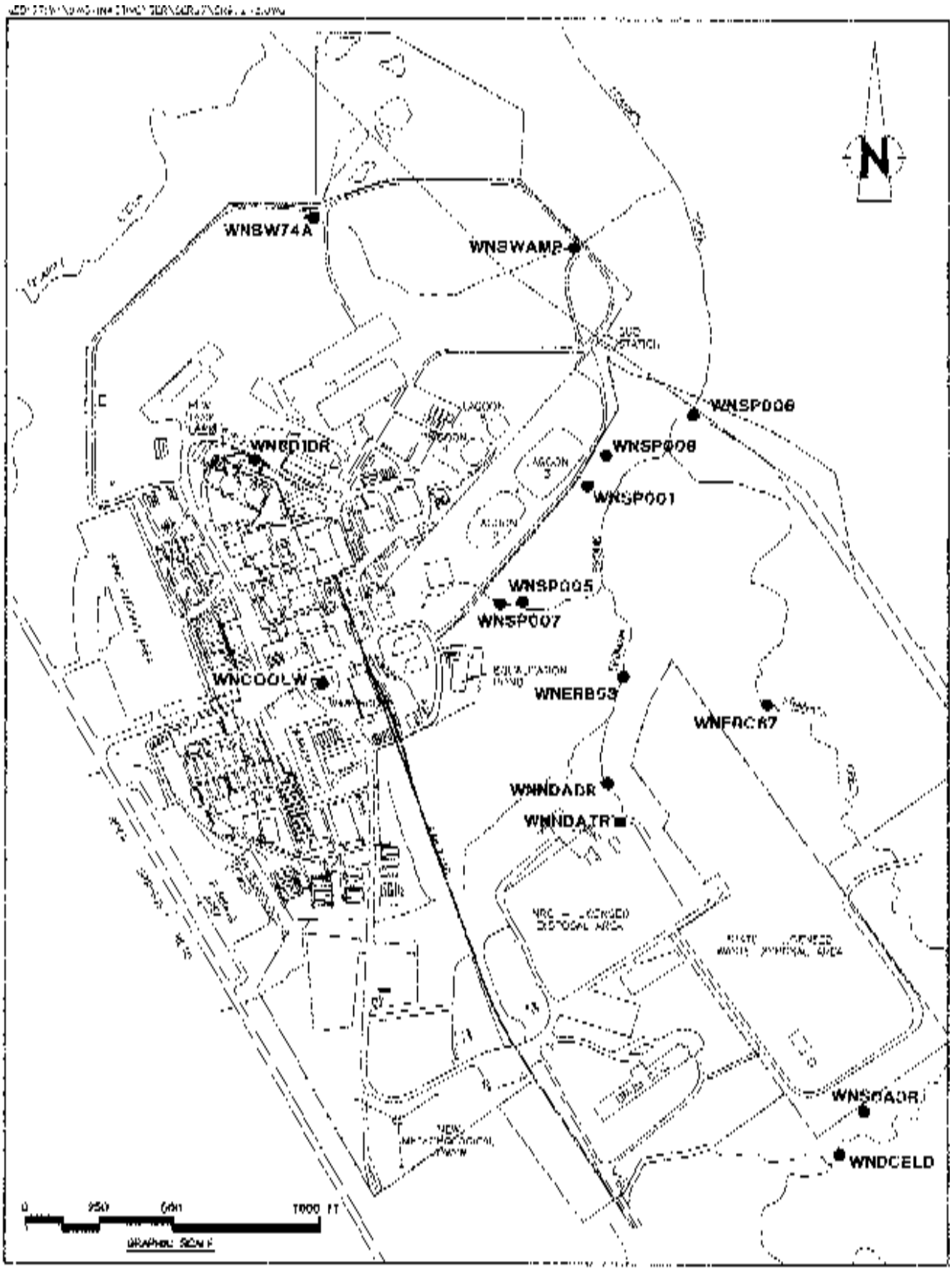

Figure 2–3. On-site Surface Water Sampling Locations.

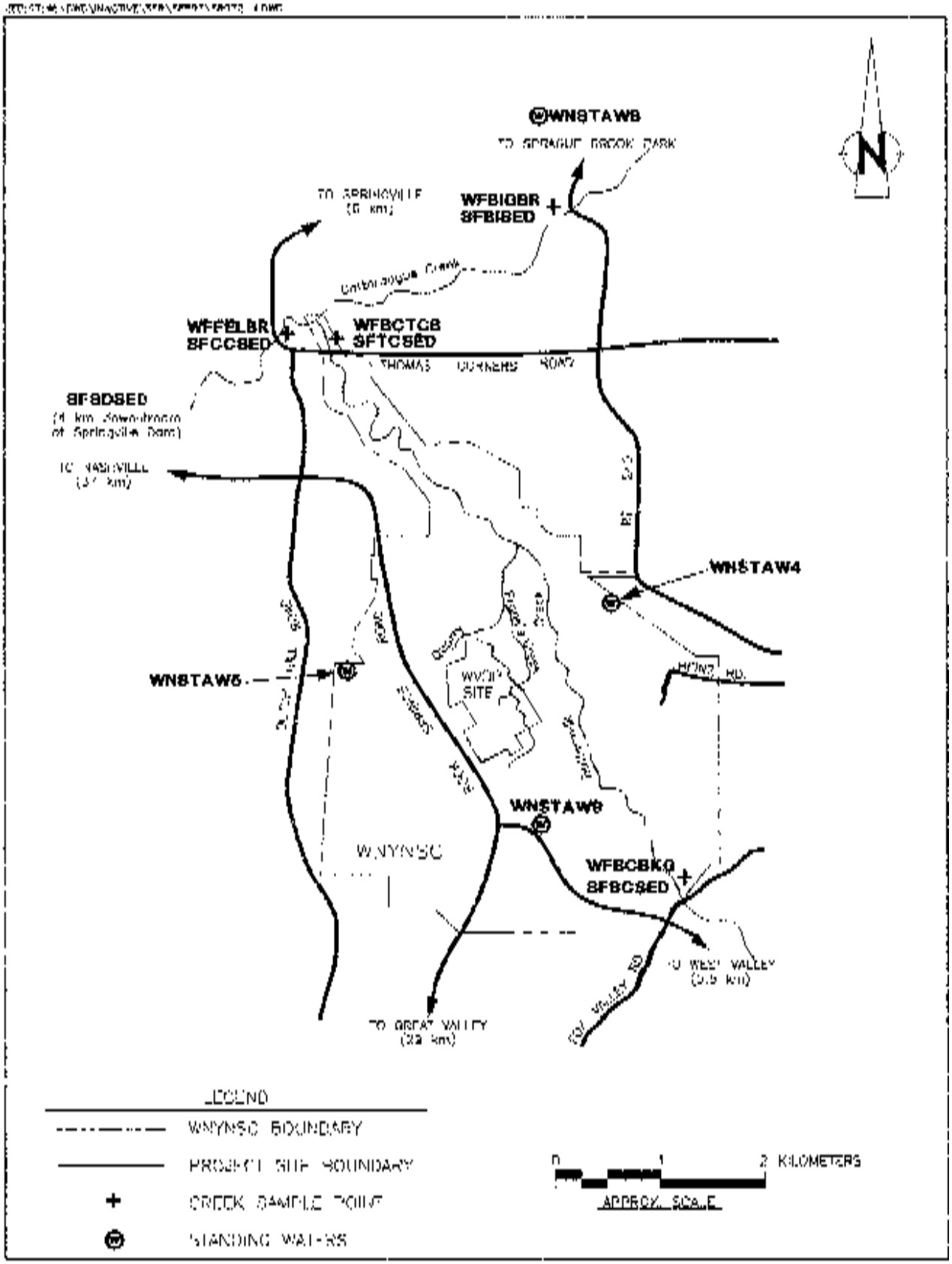

Figure 2-4. Off-site Surface Water and Sediment Sampling Locations.

discharged into the creek. Concentrations observed farther downstream at the Felton Bridge sampling location, the first point of public access to surface waters leaving the WVDP site, continue to be nearly indistinguishable from background.

North Swamp and Northeast Swamp Sampling Locations

The north and northeast swamp drainages on the site's north plateau are two major channels that conduct surface water and emergent groundwater off-site. Samples from the north swamp drainage at location WNSW74A and from the northeast swamp drainage at sampling point WNSWAMP are collected from the automated samplers every week. (See Fig. 2-3 [p. 2-6].) Samples from both locations are analyzed weekly for gross alpha, gross beta, tritium, pH, and conductivity. Composites of weekly samples are also analyzed for a full range of specific radionuclides. Semiannual grab samples from these locations are analyzed for additional chemical parameters.

Results for samples collected at location WNSW74A, which monitors drainage to Quarry Creek from the northern end of the Project premises, are summarized in *Appendix C-1*, Table C-1.8 (p. C1-9). The highest monthly strontium-90 result at WNSW74A was less than 0.7% of its DCG. The highest weekly tritium result at WNSW74A was only 0.008% of its DCG. Tritium at this location typically is below the detection limit.

Sampling point WNSWAMP also monitors surface water drainage from the site's north plateau. (See Tables 2-1 and 2-2 (p. 2-9) and *Appendix C-1*, Table C-1.7 [p.C1-8].) Waters from this drainage run into Frank's Creek downstream of location WNSP006. An upward trend in gross beta concentration from 1993 through 1997 at location WNSWAMP is discussed in ***Chapter 3, Groundwater Monitoring***, under *Special Monitoring, Northeast Swamp Drainage Monitoring* (p.3-17). The highest weekly tritium concentration at this location in 1997 was 2.86E-07μCi/mL, which is above that observed at the background

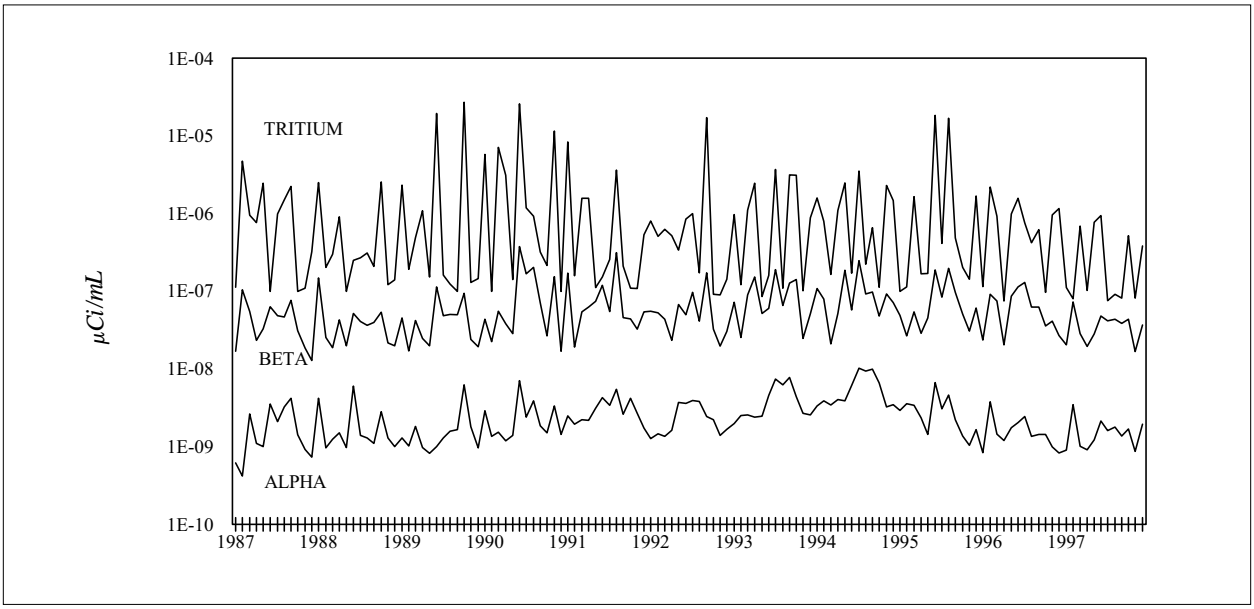

Figure 2-5. Eleven-Year Trends of Gross Alpha, Gross Beta, and Tritium Concentrations at Sampling Location WNSP006

Table 2-1
1997 Gross Alpha Concentrations at Surface Water Sampling Locations

Location	Number of Samples	Range		Annual Average	
		(μCi/mL)	(Bq/L)	(μCi/mL)	(Bq/L)
OFF-SITE					
WFBIGBR	12	<5.55E-10 — 1.52E-09	<2.05E-02 — 5.64E-02	5.10±7.85E-10	1.89±2.91E-02
WFBCBKG	12	<4.68E-10 — 1.64E-09	<1.73E-02 — 6.08E-02	6.97±6.19E-10	2.58±2.29E-02
WFBCTCB	12	<5.32E-10 — 2.07E-09	<1.97E-02 — 7.67E-02	1.13±0.74E-09	4.19±2.76E-02
WFFELBR	52	<1.28E-09 — 1.05E-08	<4.74E-02 — 3.87E-01	1.12±0.86E-09	4.15±3.19E-02
ON-SITE					
WNNDADR	12	<9.77E-10 — 2.11E-09	<3.62E-02 — 7.82E-02	0.95±1.31E-09	3.50±4.86E-02
WNSWAMP	52	<9.66E-10 — 4.81E-09	<3.58E-02 — 1.78E-01	0.73±1.37E-09	2.70±5.07E-02
WNSW74A	52	<7.71E-10 — 3.10E-09	<2.85E-02 — 1.15E-01	0.42±1.25E-09	1.55±4.63E-02
WNSP006	52	<7.48E-10 — 5.86E-09	<2.77E-02 — 2.17E-01	0.96±1.21E-09	3.55±4.48E-02

Table 2-2
1997 Gross Beta Concentrations at Surface Water Sampling Locations

Location	Number of Samples	Range		Annual Average	
		(μCi/mL)	(Bq/L)	(μCi/mL)	(Bq/L)
OFF-SITE					
WFBIGBR	12	<1.00E-09 — 3.22E-09	<3.71E-02 — 1.19E-01	1.74±1.01E-09	6.43±3.74E-02
WFBCBKG	12	<1.26E-09 — 2.32E-09	<4.67E-02 — 8.57E-02	1.50±1.25E-09	5.54±4.62E-02
WFBCTCB	12	3.52E-09 — 8.05E-09	1.30E-01 — 2.98E-01	5.61±1.47E-09	2.08±0.55E-01
WFFELBR	52	<5.82E-10 — 2.26E-08	<2.16E-02 — 8.37E-01	3.11±1.34E-09	1.15±0.50E-01
ON-SITE					
WNNDADR	12	1.18E-07 — 1.68E-07	4.35E+00 — 6.23E+00	1.45±0.06E-07	5.38±0.21E+00
WNSWAMP	52	8.86E-07 — 4.03E-06	3.28E+01 — 1.49E+02	2.21±0.03E-06	8.18±0.09E+01
WNSW74A	52	3.85E-09 — 1.85E-08	1.42E-01 — 6.84E-01	9.83±2.39E-09	3.64±0.88E-01
WNSP006	52	1.11E-08 — 1.15E-07	4.12E-01 — 4.27E+00	3.37±0.39E-08	1.25±0.14E+00

location WFBCBKG but below the 2E-03 μCi/mL DCG for tritium. The 1997 WNSWAMP average monthly tritium concentration was slightly less than the 1996 concentration.

Other Surface Water Sampling Locations

Sampling point WNSP005, which monitors drainage from the east side of the main plant, and WNFRC67, which monitors surface waters draining from the east side of the SDA, are both grab-sampled on a monthly basis. Samples are analyzed for pH, gross alpha, gross beta, and tritium.

Another sampling point, WN8D1DR, is at a storm sewer manhole access that originally collected surface and shallow groundwater flow from the high-level waste tank farm area. Notable increases in gross beta and tritium activity at this location, attributable to historical site contamination, were described in the 1993 and 1994 annual site environmental reports. Since July 1993 the access has been valved off from the original high-level waste tank farm drainage area to prevent collected waters from draining freely to the surface. A sample continues to be taken from the access point and is analyzed weekly for gross alpha and beta, tritium, and pH. A monthly composite is analyzed for gamma radionuclides and strontium-90. However, samples collected from this location are not thought to be indicative of either local groundwater or surface water conditions.

NDA Sampling Locations

The surface water drainage path downstream of the Nuclear Regulatory Commission (NRC)-licensed disposal area (NDA) is monitored at location WNNDADR using an automated sampler. (See Fig. 2-3 [p. 2-6].) Weekly samples are analyzed for pH and tritium. Samples also are analyzed for nonpurgeable organic carbon (NPOC) and total organic halogens (TOX). Samples are composited and analyzed on a monthly basis for gross alpha, gross beta, tritium, and gamma-emitting radionuclides. Quarterly composites are analyzed for strontium-90 and iodine-129.

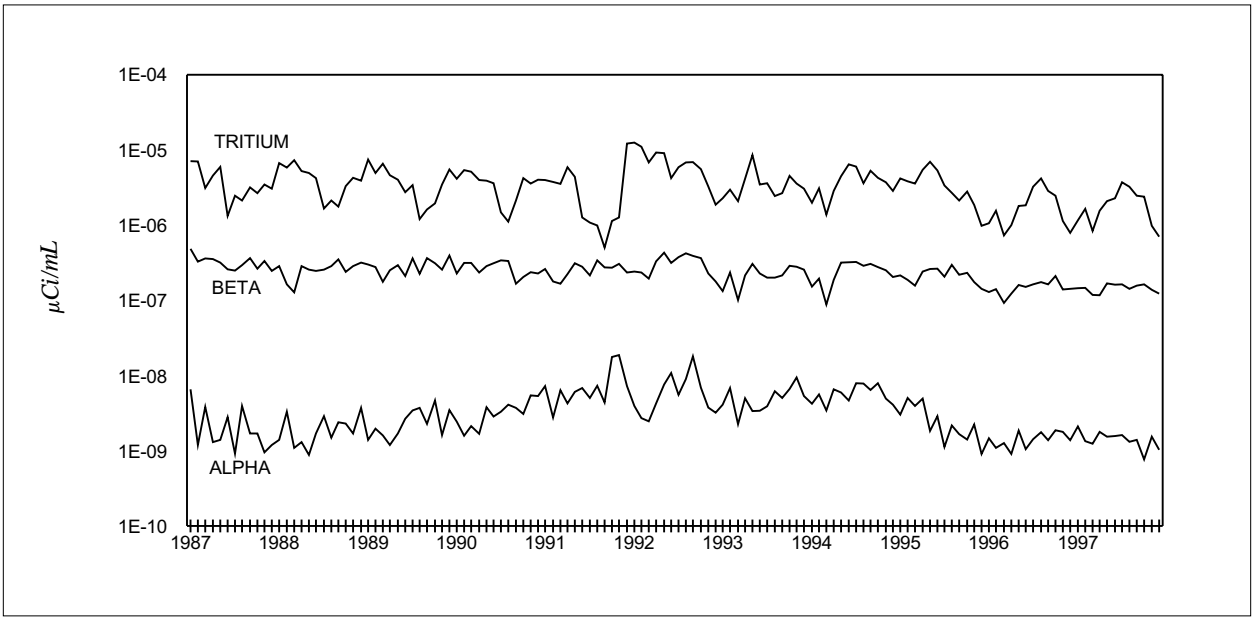

Figure 2-6. Eleven-Year Trends of Gross Alpha, Gross Beta, and Tritium Concentrations at Sampling Location WNNDADR

Gross beta concentrations at location WNNDADR averaged 1.45E-07 μCi/mL in 1997. (See Table 2-2 [p. 2-9] and Table C-1.19 [p. C1-15] in *Appendix C-1*.) Concentrations at this location were above the average measured at background location WFBCBKG but are all well below the DCG for strontium-90 in water (1E-06 μCi/mL). In fact, the highest quarterly composite isotopic strontium-90 result was only 6.40% of its DCG. Although gross beta activity is higher downstream of the NDA at WNNDADR than in waters from the interceptor trench, which is closer to the NDA, the overall trend for gross beta concentrations at this location has remained relatively constant or shown a slight decrease (Fig. 2-6 [p.2-10]). Except for seasonal variations, the same is true of tritium. Residual contamination from past waste burial activities in soils outside the NDA is the likely source of gross beta activity in samples from WNNDADR. A discussion of tritium concentrations is provided at the end of this chapter under *Special Monitoring*.

A key indicator of any possible migration of nonradiological organic contaminants from the NDA would be the presence of significant iodine-129 in samples from WNNDADR. Iodine-129 is known to travel with the organic contaminants present in the NDA, but it is typically more soluble in water. In 1997 there were no positive detections of iodine-129 in water samples collected at this location. In addition, although NPOC and TOX values are elevated slightly above background surface water (WFBCBKG) values, it is believed that NPOC and TOX values observed at WNNDADR reflect only seasonal variations.

Iodine-129 values obtained from waters collected from the NDA interceptor trench (WNNDATR), which is closer to the NDA than WNNDADR, were all either below or statistically the same as the analytical detection limit. (See *Appendix C-1*, Table C-1.20 [p. C1-16].) Tritium activity in trench waters is generally higher than that measured at WNNDADR.

Every month, weekly samples from WNNDADR are composited and analyzed for cesium-137. During the entire year only one such composite displayed a positive detection. The February 1997 cesium-137 concentration, at 1.78E-08 μCi/mL, was marginally above the detection limit.

Downstream of WNNDADR, on Erdman Brook and to the northwest of the SDA, is sampling point WNERB53. Weekly samples collected from this point are analyzed for pH, gross alpha, gross beta, and tritium. In addition to samples collected by the WVDP, independent samples are collected and analyzed by the New York State Department of Health (NYSDOH) at this location and at WNFRC67, which monitors waters draining from the east side of the SDA. Although radiological samples collected at WNERB53 do reflect, in some cases, historical waste disposal activities, none of the observed concentrations exceed or even approach the most conservative DCG.

Standing Pond Water

In addition to sampling water from flowing streams, samples from ponds and lakes within the retained premises (WNYNSC) also are collected. Tests for various radiological and water quality parameters are performed annually to verify that no major changes in standing water within the Project facility environs are occurring.

Four ponds near the site were tested in 1997; values for gross alpha, gross beta, and tritium were not significantly different from historical background values. The background samples are collected from a pond 14 kilometers (8.7 mi) north of the Project (WNSTAWB, Fig. 2-4 [p. 2-7]. See Table C-1.21 [p. C1-17].)

Off-site Surface Water Sampling

A map showing off-site surface water and sediment sample locations is found on Figure 2-4 (p. 2-7). Data from off-site sample points show that average gross beta radioactivity concentrations in Buttermilk Creek downstream of the WVDP site generally tend to be higher than concentrations upstream of the site because small amounts of radioactivity from the site enter Buttermilk Creek via Frank's Creek. This is particularly observable during periods of lagoon 3 discharge. Tables 2-1 and 2-2 (p.2-9) list the ranges and annual averages for gross alpha and gross beta activity at surface water locations. Additional information is available in the *Appendix C-1* tables for all off-site surface water monitoring locations.

Cattaraugus Creek at the Felton Bridge Sampling Location

A sampler is located off-site on Cattaraugus Creek at Felton Bridge (WFFELBR) just downstream of Cattaraugus Creek's confluence with Buttermilk Creek, which is the major surface drainage from the WNYNSC. (See Fig. 2-4 [p. 2-7].) The sampler collects a 50-mL aliquot from the creek every half-hour. A chart recorder registers the stream depth during the sampling period so that a flow-weighted weekly sample can be proportioned into a monthly composite. The weekly samples are analyzed for gross alpha, gross beta, tritium, and pH, and the sample composite is analyzed for gross alpha, gross beta, tritium, strontium-90, and gamma-emitting radionuclides.

The highest concentrations in monthly composite water samples from this Cattaraugus Creek sampler during 1997 show strontium-90 to be only 0.4% of the DCG for strontium-90 in water. As in 1996, there were no positive detections of cesium-137 in Cattaraugus Creek during 1997. (See Table C-1.24 [p. C1-19].) Although gross beta levels at the Felton Bridge sampling location sometimes are elevated slightly during months of lagoon 3 discharge, overall, the yearly average gross beta activity for Cattaraugus Creek at Felton Bridge is nearly indistinguishable from background. Figure 2-7 (below) shows the eleven-year trends for Cattaraugus Creek samples

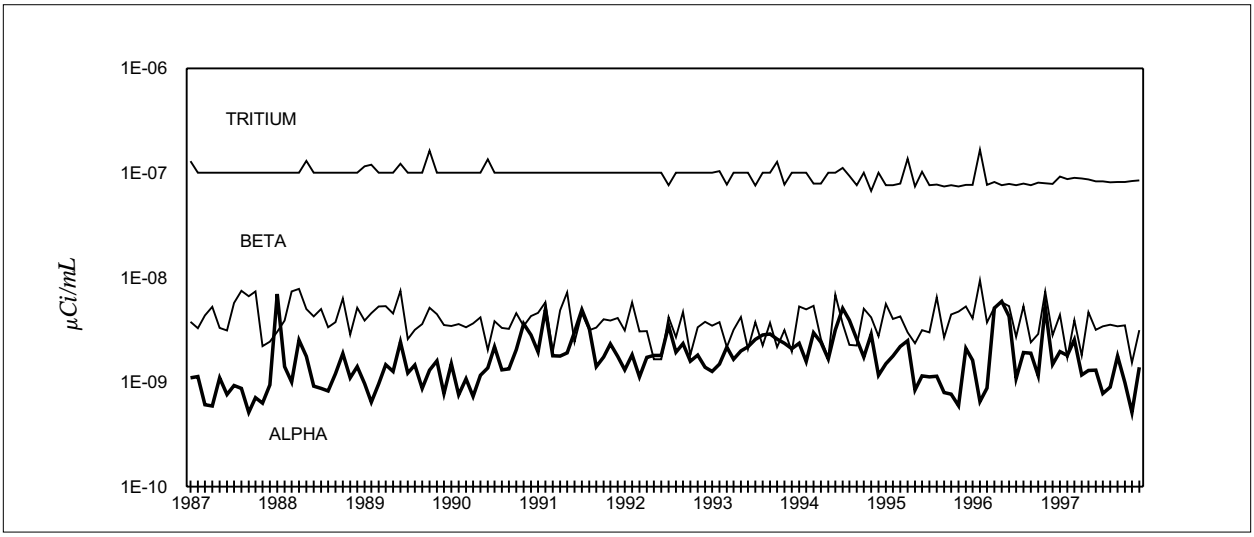

Figure 2-7. Eleven-Year Trends of Gross Alpha, Gross Beta, and Tritium Concentrations at Sampling Location WFFELBR

analyzed for gross alpha, gross beta, and tritium. For the most part, tritium concentrations represent method detection limits and not detected radioactivity. Gross beta activity appears to have remained constant at this location since 1987.

Fox Valley Road and Thomas Corners Bridge Sampling Locations

In addition to the Cattaraugus Creek sampler, two surface water monitoring stations are located on Buttermilk Creek, one upstream of the WVDP and one downstream. (See Fig. 2-4 [p. 2-7].) Samplers collect water from a background location upstream of the Project at Fox Valley Road (WFBCBKG) and from a location at Thomas Corners Road that is downstream of the Project and upstream of Buttermilk Creek's confluence with Cattaraugus Creek (WFBCTCB).

These samplers collect a 50-mL aliquot every half-hour. Samples are retrieved weekly and analyzed for pH and conductivity. Samples are composited monthly and analyzed for tritium, gross alpha, and gross beta radioactivity. A quarterly composite is analyzed for gamma-emitting radionuclides and strontium-90.

Quarterly composite samples from the Fox Valley Road background location also are analyzed for carbon-14, iodine-129, technetium-99, alpha-emitting radionuclides, and total uranium. (Table C-1.22 [p. C1-18] shows monthly and quarterly radioactivity concentrations upstream of the site at Fox Valley Road; Table C-1.23 [p. C1-19] shows monthly and quarterly radioactivity concentrations downstream of the site at Thomas Corners.)

The 1997 data from these locations show that gross beta concentrations downstream of the site at Thomas Corners Bridge are only marginally higher than background concentrations upstream of the site and tritium concentrations are no different from background. The Thomas Corners Bridge sampling point represents an important link in the pathway to humans because dairy cattle have access to waters here. Naturally occurring sources as well as manmade sources contribute to the gross beta radioactivity. However, if the maximum beta concentration in Buttermilk Creek downstream of the Project at Thomas Corners Bridge were entirely attributable to strontium-90, then the radioactivity would represent only 0.80% of the DCG, down from 1.4% in 1996.

In the spring of 1997 severe stream bank erosion became evident at this location. The embankment was reconstructed and stabilized in the fall. A new water sampler weather enclosure was installed and the drainage was improved. While this work was being completed a portable water sampler was operated about 70 yards upstream in Buttermilk Creek. The routine sampling schedule was not interrupted during the upgrade.

Sediment Sampling

Figure 2-4 (p. 2-7) shows the sediment sampling locations. Sediments are grab-sampled annually at or near three of the automatic water sampling locations and at two additional points. Downstream locations are Buttermilk Creek at Thomas Corners Road (SFTCSED), Cattaraugus Creek at Felton Bridge (SFCCSED), and Cattaraugus Creek at the Springville dam (SFSDSED). Upstream background locations are Buttermilk Creek at Fox Valley Road (SFBCSED) and Cattaraugus Creek at Bigelow Bridge (SFBISED).

A comparison of annual averaged cesium-137 concentrations from 1986 through 1997 for these five sampling locations is illustrated in

Figure 2-8 (below). As reported in previous years, cesium-137 concentrations in sediments collected downstream of the WVDP are higher than those observed in samples collected from background locations (SFBCSED or SFBISED). As the figure indicates, concentrations appear to be staying constant with time at the downstream locations. While the cesium-137 activity in downstream Cattaraugus Creek sediments (at locations SFCCSED and SFSDSED) is elevated relative to upstream values (see *Appendix C-1*, Table C-1.30 [p.C1-24]), in perspective, it is within the range of historical background concentrations (as measured at SFGRVAL and SFNASHV) in surface soil in Western New York. (See *Appendix C-1*, Table C-1.29 [p.C1-23].)

A comparison of cesium-137 to the naturally occurring gamma-emitter potassium-40 (Fig. 2-9 [p.2-15]) for the downstream location nearest the Project (Buttermilk Creek at Thomas Corners Road — SFTCSED) indicates that cesium-137 is present at levels lower than naturally occurring gamma emitters. The 1997 concentration was about one-half of the concentration observed in 1996. In addition, when alpha isotopic results for background location SFBCSED, upstream of the site, are compared to those for SFTCSED, downstream of the site, no significant differences are observed.

Air Monitoring

On-site Ventilation Systems

Permits obtained from the U.S. Environmental Protection Agency (EPA) allow air with small amounts of radioactivity to be released from plant ventilation stacks during normal operations. The air released must meet criteria specified in the National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations to ensure that the environment and the public's health and safety are not adversely affected. Dose-based comparisons of WVDP emissions against NESHAP criteria are presented in ***Chapter 4, Radiological Dose Assessment***. Although generally less stringent than NESHAP criteria, DOE DCGs are more conducive to concentration-based compari-

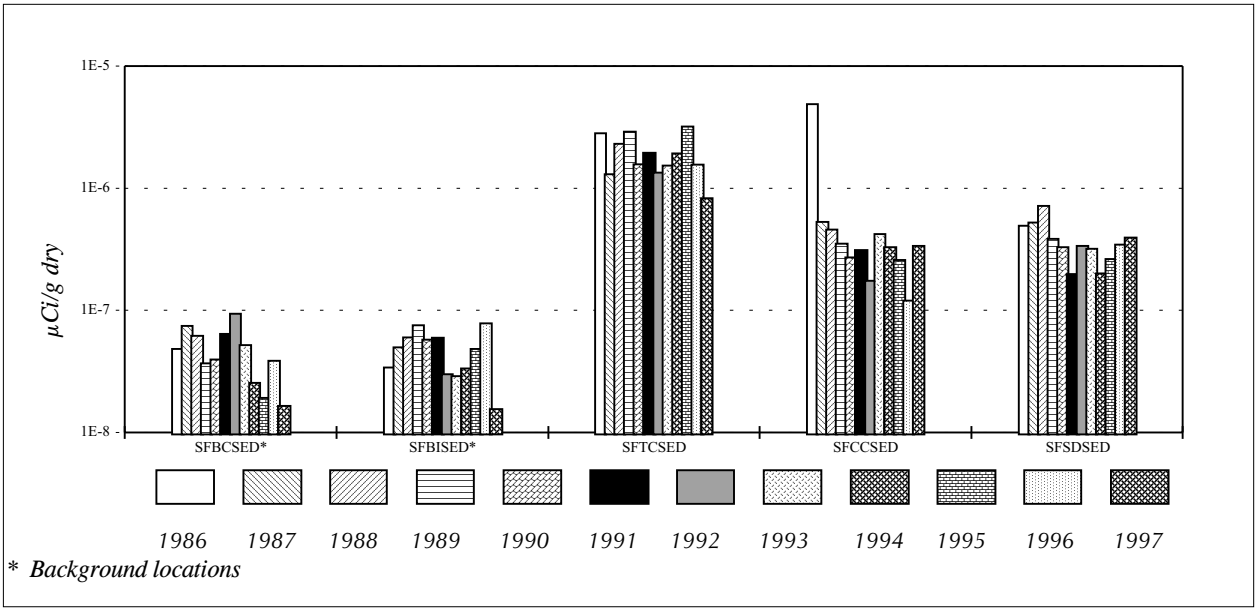

Figure 2-8. Twelve-Year Trends of Cesium-137 in Stream Sediment at Two Locations Upstream and Three Locations Downstream of the WVDP

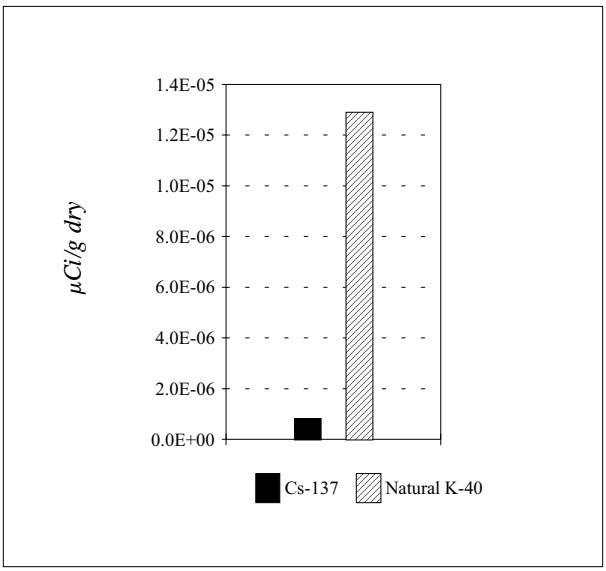

Figure 2-9. Comparison of Cesium-137 with Naturally Occurring Potassium-40 Concentrations in 1997 at Downstream Sampling Location SFTCSED

sons and are used in this chapter for evaluating concentrations of radionuclides in WVDP emissions. Parameters measured include gross alpha and gross beta, tritium, and various radionuclides such as cesium-137 and strontium-90. When comparing concentrations with dose limits for screening purposes, gross alpha and beta radioactivities are assumed to come from americium-241 and strontium-90, respectively, because the dose effects for these radionuclides are the most limiting for major particulate emissions at the WVDP. (DOE standards and DCGs for radionuclides of interest at the WVDP are found in *Appendix B* [p.B-3].)

The exhaust from each permitted fixed ventilation system on-site is continuously filtered, monitored, and sampled as it is released to the atmosphere. Specially designed isokinetic sampling nozzles continuously remove a representative portion of the exhaust air, which is then drawn through very fine glass fiber filters to trap any particles. Sensitive detectors continuously monitor the radioactivity on these filters and provide readouts of alpha and beta radioactivity levels.

Separate sampling units on the ventilation stacks of the permitted systems contain another glass fiber filter that is removed every week and tested in the laboratory. Six of these sampling systems also contain an activated carbon cartridge used to collect gaseous iodine-129.

In addition to these samples, water vapor from the main plant ventilation stack (ANSTACK) and the supernatant treatment system (ANSTSTK) is collected by trapping moisture in silica gel desiccant columns. The trapped water is distilled from the silica gel desiccant and analyzed for tritium.

Because tritium, iodine, and other isotopic concentrations are quite low, the large-volume samples collected weekly from the main plant stack and from other emission-point samplers provide the only practical means of determining the amount of specific radionuclides released from the facility. In addition to scheduled sampling and analysis of ANSTACK filters for those parameters defined in *Appendix A* of this report, filters are routinely analyzed for strontium-89 and cesium-137 as part of operational-safety monitoring.

The Main Plant Ventilation Stack

Figure 2-1 (p. 2-4) shows the locations of on-site air monitoring and sampling points.

The main ventilation stack is potentially the greatest contributor to airborne releases. The main stack sampling system collects a continuous air sample from this emission point. A high sample-collection flow rate through multiple intake nozzles ensures a representative sample for both the weekly sample and the on-line monitoring system. The total quantity of gross alpha, gross beta, and tritium released each

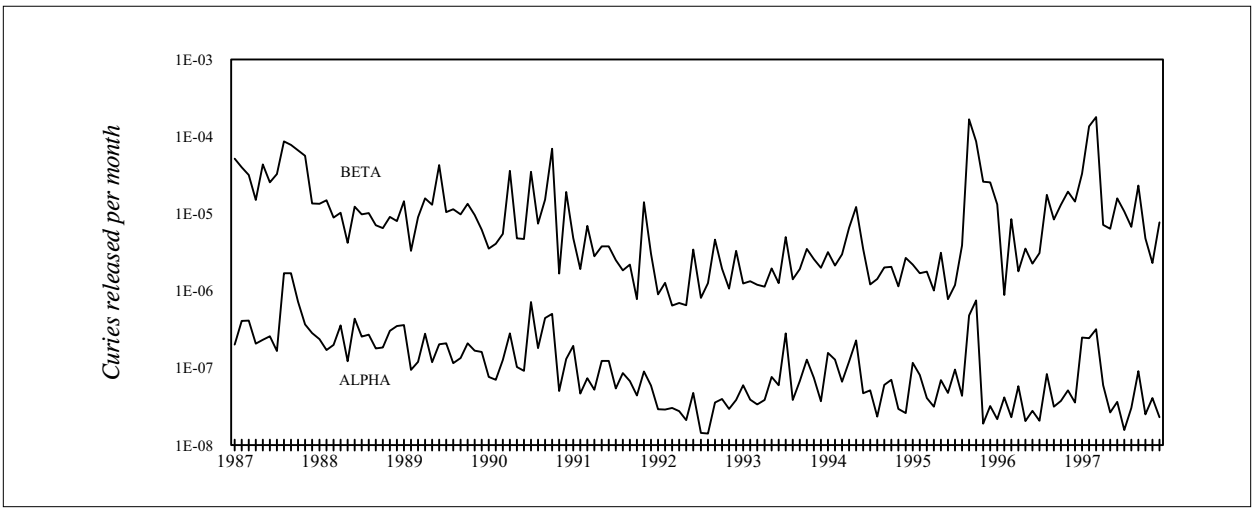

Figure 2-10. Eleven-Year Trends of Gross Alpha and Gross Beta Activity at the Main Stack Sampling Location (ANSTACK)

month from the main stack, based on weekly measurements, is shown in *Appendix C-2*, Table C-2.1 (p. C2-3). Figure 2-10 (above) shows the eleven-year trends in main stack samples analyzed for gross alpha and gross beta activity. The figure indicates a steady five-year downward trend in activity observed for both gross alpha and gross beta from 1987 to mid-1992. From mid-1992 throughout mid-1995 both gross alpha and beta activities rose slightly and then leveled off. During the third and fourth quarters of 1995, concentrations of gross alpha, gross beta, and gamma-emitting radionuclides in ventilated air increased because of transfers of cesium-loaded zeolite from waste tank 8D-1 to 8D-2.

During the first two quarters of 1996 the concentrations returned to levels observed before the zeolite transfer period. As expected, increases were observed during the third and fourth quarters of 1996, coinciding with the start-up of high-level waste vitrification. The levels fluctuated with vitrification operations in 1997 while remaining at generally higher levels than those observed in mid-1992.

A comparison of airborne radioactivity concentrations released from the main plant ventilation in 1997 with the DOE DCGs in Table C-2.2 (p. C2-4) indicates that at the point of stack discharge, average radioactivity levels were already below concentration guidelines for airborne radioactivity in an unrestricted environment. Airborne concentrations from the stack to the site boundary are further reduced by dilution by an average factor of about 200,000. Samples from ambient air perimeter monitors at the site boundary confirm that site operations had no discernible effect on air quality at these perimeter locations.

Vitrification Facility Sampling System

Sampling point ANVITSK and the seismically protected backup sample point ANSEISK monitor emissions from the vitrification heating, ventilation, and air conditioning (HVAC) system ventilation stack (Tables C-2.3 and C-2.4 [pp. C2-5 and C2-6]). The vitrification off-gas ventilation is emitted through the main plant stack. Air exhausted to the environment from both locations is monitored for radioactivity. Results gathered before July 1996 represent initial pre-vitrification baseline or background levels. Data obtained from July 1996 through the end of 1997 were collected during actual operation of the vitrification facility. A comparison of data collected before and

after vitrification startup from the vitrification system (HVAC) ventilation stack shows almost no discernible difference in concentrations in emissions from this facility.

Other On-site Sampling Systems

Sampling systems similar to those of the main stack monitor airborne effluents from the 01-14 building (formerly housing the cement solidification system) ventilation stack (ANCSSTK), the contact size-reduction facility ventilation stack (ANCSRFK), and the supernatant treatment system ventilation stack (ANSTSTK).

A temporary monitoring system was brought on-line at the container sorting and packaging facility ventilation stack (ANCSPFK) in March 1996. The container sorting and packaging facility (CSPF) is a self-contained room within lag storage area #4. Containers of radioactively contaminated materials are opened and hand-sorted in the CSPF before compaction and storage or decontamination. (Durable items such as metal piping can be reused after decontamination.) The CSPF is constantly ventilated during use. The temporary stack monitoring system operated from March 1996 to March 1997 while a permanent system was being designed and installed. The permanent system was brought on-line in March 1997.

The 1997 samples from ANCSSTK, ANCSRFK, ANSTSTK, and ANCSPFK showed detectable gross radioactivity in some cases as well as specific beta- and alpha-emitting radionuclides but did not approach any Department of Energy effluent limitations. Tables C-2.5 through C-2.8 (pp. C2-7 through C2-10) show monthly totals of gross alpha and beta radioactivity and quarterly total radioactivity released for specific radionuclides for each of these sampling locations.

In addition, a temporary demonstration decontamination facility using carbon dioxide (CO_2) cleaning technology was brought on-site in late 1996 and operated into the summer of 1997. Results of sampling from that facility in 1997 are included in Table C-2.15 (p. C2-16).

Three other operations are routinely monitored for airborne radioactive releases: the supercompactor volume-reduction ventilation system (ANSUPCV), the low-level waste treatment facility ventilation system (ANLLWTVH), and the contaminated clothing laundry ventilation system (ANLAUNV).

The supercompactor ventilation (ANSUPCV) has not operated since August 1995. The unit will be removed from the WVDP in 1998.

The low-level waste treatment facility ventilation system and the contaminated clothing laundry ventilation system are sampled for gross alpha and gross beta radioactivity. Data for these two facilities are presented in Tables C-2.9 and C-2.10 (p. C2-11). These emission points are not required to be permitted because the potential magnitude of the emissions is so low. Although only semiannual grab sampling is required to verify the low level of emissions, both ventilations are sampled continuously while discharging to the environment. The low-level waste treatment facility is scheduled to be replaced by a new facility in the spring of 1998.

Permitted portable outdoor ventilation enclosures (OVEs) are used occasionally to provide the ventilation necessary for the safety of personnel working with radioactive materials in areas outside permanently ventilated facilities. Air samples from OVEs are collected continuously while those emission points are discharging, and data from these units are included in annual airborne emission evaluations.

In 1997 average discharges at the point of release from portable outdoor ventilation units were well below DOE guidelines for alpha and beta radioactivity in an unrestricted environment. Dilution from the point of release to the site boundary would further reduce these concentrations.

In February 1995 ambient air monitors were installed near the lag storage area (ANLAGAM) and near the NDA (ANNDAAM). The 1997 monitoring data are presented in *Appendix C-2*, Tables C-2.11 and C-2.12 (pp. C2-12 and C2-13).

An ambient air sampler (ANSDAT9) monitors potential diffuse releases of radioactivity associated with the SDA, which is managed by the New York State Energy and Research Development Authority (NYSERDA). The ANSDAT9 sampler could also detect site-wide releases to ambient air. With the exception of marginally elevated tritium, radiological results for this location are all either below analytical detection limits or are no different statistically than those observed at the background air monitoring location AFGRVAL. Even the highest positive tritium result observed (3.76E-12 μCi/mL) is only 0.004% of the DOE DCG for this radionuclide. Results of this monitoring are presented in *Appendix C-2*, Table C-2.13 (p.C2-14).

Perimeter and Remote Air Sampling

Maps of perimeter and remote air sampling locations may be found on Figure 2-2 (p. 2-5) and Figure A-9 (p. A-53).

As in previous years, airborne particulate samples for radiological analysis were collected continuously at six locations around the perimeter of the site and at four remote locations at Great Valley, West Valley, Springville, and Nashville, New York. Perimeter locations — on Fox Valley Road, Rock Springs Road, Route 240, Thomas Corners Road, Dutch Hill Road, and at the site's bulk storage warehouse — were chosen to provide historical continuity or because the location would best represent the highest potential off-site airborne concentration of radioactivity. The eleven-year trends of gross alpha and gross beta concentrations at the Rock Springs Road location are shown in Figure 2-11 (below). The remote locations provide

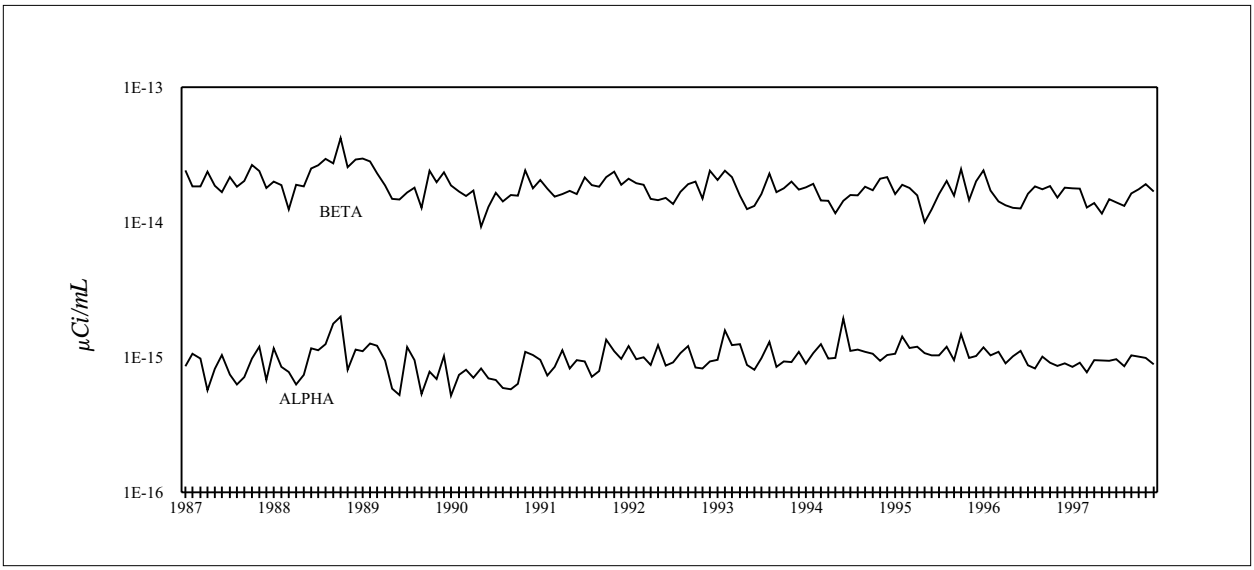

Figure 2-11. Eleven-Year Trends of Gross Alpha and Gross Beta Concentrations at the Rock Springs Road Sampling Location (AFRSPRD)

Global Fallout Sampling

Global fallout is sampled at four of the perimeter air sampler locations and at the base of the original on-site meteorological tower. Precipitation from all of the locations is collected and analyzed every month. Monthly gross alpha and gross beta results from these measurements are reported in nCi/m² and tritium results are reported in μCi/mL. (The 1997 data from these analyses and precipitation pH measurement data are found in Appendix C-2, Tables C-2.26 through C-2.30 [pp. C2-24 through C2-26].)

Fallout pot data indicate short-term effects. Long-term deposition is measured by surface soil samples collected annually near each air sampling station. Soil sample data are found in Table C-1.29 [p. C1-23] of Appendix C-1.

data from nearby communities — West Valley and Springville — and from more distant background areas. Concentrations measured at Great Valley (AFGRVAL, 29 km south of the site) and Nashville (AFNASHV, 37 km west of the site in the town of Hanover) are considered representative of regional natural background radiation. During the final week of December 1997 the Springville air sampler was relocated about 1 kilometer from its original position. Trees growing nearby had begun to encroach upon the sampler, making relocation prudent. Great care was taken to ensure that the new location met the technical requirements of a well-placed air sampler.

The air sampler tower supports that had been installed by NFS at three perimeter locations were replaced with smaller weather enclosures in order to standardize air sampling equipment. Access was improved to make it easier to maintain the sampling equipment.

All ten off-site air samplers maintain an average flow of about 40 L/min (1.4 ft³min) through a 47-millimeter glass fiber filter. The sampler heads for each of the locations are set at 1.7 meters above the ground, the height of the average human breathing zone. Filters from off-site and perimeter samplers are collected weekly and analyzed after a seven-day "decay" period to remove interference from short-lived naturally occurring radionuclides.

Gross alpha and gross beta measurements of each filter are made weekly using a low-background gas proportional counter. The gross alpha and gross beta ranges and annual averages for each of the ambient sampling points are provided in Tables 2-3 and 2-4 (p. 2-20). The 1997 concentration ranges are similar to those measured in 1996. Near-site sample concentrations are indistinguishable from background, and all reflect normal seasonal variations.

In addition, quarterly composites, which consist of filters collected each week for thirteen weeks from each sample station, are analyzed. Data from these samplers are provided in *Appendix C-2*, Tables C-2.16 through C-2.25 (pp. C2-17 to C2-23). Although tritium (as hydrogen-tritium oxide [HTO]) was positively detected on three occasions at the Rock Springs Road location near the site, those concentrations were the same as positive concentrations observed at the Great Valley background location. Three strontium-90 values marginally above the detection limit were observed at the Rock Springs Road location during 1997, but all three values overlap background concentrations. Cesium-137, cobalt-60, and, most importantly, iodine-129 remained undetected in 1997.

The gross beta concentrations in air data for the three samplers that have been in operation since before 1982 — Fox Valley, Thomas Corners, and Route 240 — averaged about 1.79E-14μCi/mL (6.62E-04 Bq/m³) in 1996 and 1.72E-14 μCi/mL

Table 2-3

1997 Gross Alpha Concentrations at Off-Site, Perimeter, and On-site Ambient Air Sampling Locations

Location	Number of Samples	Range		Annual Average	
		(μCi/mL)	(Bq/m^3)	(μCi/mL)	(Bq/m^3)
AFFXVRD	52	<6.46E-16 — 2.42E-15	<2.39E-05 — 8.94E-05	6.92±9.33E-16	2.56±3.45E-05
AFRSPRD	52	<5.67E-16 — 1.81E-15	<2.10E-05 — 6.70E-05	5.92±9.26E-16	2.19±3.42E-05
AFRT240	52	<6.42E-16 — 2.00E-15	<2.38E-05 — 7.40E-05	6.78±9.58E-16	2.51±3.54E-05
AFSPRVL	52	5.13E-16 — 1.91E-15	1.90E-05 — 7.08E-05	4.64±8.87E-16	1.72±3.28E-05
AFTCORD	52	<4.23E-16 — 1.77E-15	<1.57E-05 — 6.53E-05	6.77±9.58E-16	2.51±3.54E-05
AFWEVAL	52	5.76E-16 — 2.06E-15	2.13E-05 — 7.61E-05	6.31±9.08E-16	2.33±3.36E-05
AFGRVAL	52	<5.66E-16 — 1.75E-15	<2.10E-05 — 6.47E-05	6.53±9.39E-16	2.42±3.48E-05
AFBOEHN	52	6.43E-16 — 2.83E-15	2.38E-05 — 1.05E-04	7.51±9.69E-16	2.78±3.58E-05
AFNASHV	52	<6.39E-16 — 2.13E-15	<2.36E-05 — 7.88E-05	7.21±9.70E-16	2.67±3.59E-05
AFBLKST	52	<4.49E-16 — 1.98E-15	<1.66E-05 — 7.32E-05	5.24±8.78E-16	1.94±3.25E-05
ANLAGAM	52	<3.46E-16 — 2.83E-15	<1.28E-05 — 1.05E-04	6.35±6.63E-16	2.35±2.45E-05
ANNDAAM	52	<4.91E-16 — 2.32E-15	<1.82E-05 — 8.58E-05	7.78±7.21E-16	2.88±2.67E-05

Table 2-4

1997 Gross Beta Concentrations at Off-Site, Perimeter, and On-Site Ambient Air Sampling Locations

Location	Number of Samples	Range		Annual Average	
		(μCi/mL)	(Bq/m^3)	(μCi/mL)	(Bq/m^3)
AFFXVRD	52	8.31E-15 — 3.82E-14	3.07E-04 — 1.41E-03	1.79±0.33E-14	6.63±1.24E-04
AFRSPRD	52	4.81E-15 — 3.04E-14	1.78E-04 — 1.13E-03	1.54±0.33E-14	5.72±1.21E-04
AFRT240	52	7.72E-15 — 3.35E-14	2.86E-04 — 1.24E-03	1.78±0.34E-14	6.57±1.27E-04
AFSPRVL	52	6.16E-15 — 3.05E-14	2.28E-04 — 1.13E-03	1.47±0.32E-14	5.45±1.18E-04
AFTCORD	52	7.30E-15 — 3.02E-14	2.70E-04 — 1.12E-03	1.62±0.33E-14	6.00±1.23E-04
AFWEVAL	52	5.98E-15 — 3.79E-14	2.21E-04 — 1.40E-03	1.84±0.33E-14	6.82±1.24E-04
AFGRVAL	52	4.66E-15 — 3.10E-14	1.73E-04 — 1.15E-03	1.64±0.33E-14	6.05±1.22E-04
AFBOEHN	52	6.18E-15 — 3.82E-14	2.29E-04 — 1.42E-03	1.96±0.35E-14	7.27±1.30E-04
AFNASHV	52	<5.06E–15 — 3.64E-14	<1.87E-04 — 1.35E-03	1.72±0.34E-14	6.35±1.24E-04
AFBLKST	52	7.32E-15 — 3.00E-14	2.71E-04 — 1.11E-03	1.56±0.32E-14	5.76±1.18E-04
ANLAGAM	52	<1.37E-15 — 2.65E-14	<5.07E-05 — 9.79E-04	1.29±0.23E-14	4.78±0.85E-04
ANNDAAM	52	6.66E-15 — 3.46E-14	2.46E-04 — 1.28E-03	1.72±0.26E-14	6.36±0.96E-04

(6.37E-04 Bq/m^3) in 1997. The average gross beta concentration at the two background sampling locations — Great Valley and Nashville — was 1.67E-14 μCi/mL (6.19E-04 Bq/m^3) in 1997.

Off-site Surface Soil Sampling

Maps of off-site surface soil sampling locations may be found on Figures A-6 and A-9 (pp.A-50 and A-53).

Soil from the upper two inches of the ground near the perimeter air samplers is collected annually to measure the radioactivity deposited by worldwide fallout. Samples were collected in 1997 from ten locations: six near-site points on the perimeter of the retained premises (WNYNSC), two in nearby communities, and two in locations 20 to 40 kilometers distant from the Project. Analyses for gross alpha and beta, cesium-137, strontium-90, plutonium-239/240, and americium-241 at all ten locations and analyses for uranium radionuclides and total uranium at three points were compared among the sample locations.

The measured concentrations (Table C-1.29 [p.C1-23]) are typical of normal background concentrations in the region, with two exceptions: Soil from the Rock Springs Road air sampler location has consistently shown a higher-than-background cesium-137 concentration. This sampler is known to be within an extended area of elevated cesium activity that was identified by a 1979 survey, well before the Project was initiated. The 1997 strontium-90 concentrations at the Rock Springs Road and Route 240 locations decreased from 1996 levels to that observed in previous years. This decrease supports the statement in last year's report that the 1996 levels were probably the result of analytical uncertainties rather than Project releases to the environment. At the Thomas Corners Road location the 1997 strontium-90 concentration increased from the 1996 level but remained close to the range of historical background variation.

A single elevated americium-241 value observed at the Boehn Road location, although greater than results from the background locations, is most likely due to analytical uncertainty, given no concurrent rise in any other alpha-emitting radionuclides or cesium-137 in the same sample.

The 1997 results show that detectable concentrations of strontium-90 and cesium-137 (both of which are present in worldwide fallout), and man-made alpha-emitting radionuclides were generally within the same range of uncertainty as background samples.

Radioactivity in the Food Chain

Maps showing biological sampling points are found on Figures 2-12 (p. 2-22) and A-9 (p.A-53).

Each year food samples are collected from locations near the site (Fig. 2-12 [p. 2-22] and from remote locations (Fig. A-9 [p. A-53]). Fish and deer are collected during periods when they would normally be taken by sportsmen for consumption. In addition, milk is collected monthly and beef semiannually from cows that graze near the site and at remote locations. Hay, corn, apples, and beans are collected at the time of harvest.

Fish

Fish are obtained, under a collector's permit, by electrofishing, a method that temporarily stuns the fish, allowing them to be netted for collection. Compared to sport fishing, this method allows a more species-selective control, with unwanted fish being returned to the creek essentially unharmed. Twenty fish samples are collected every year (ten semiannually) above the

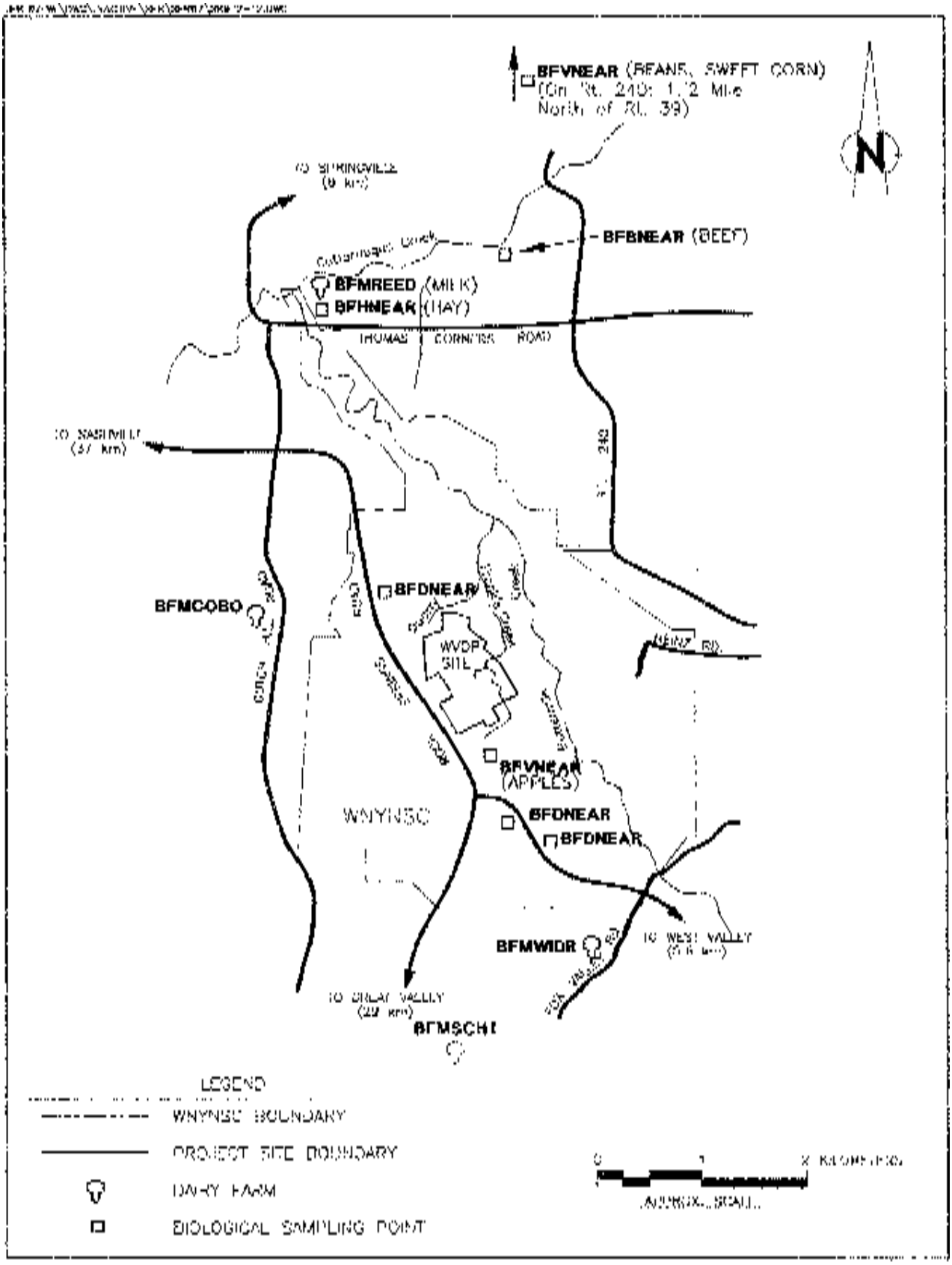

Figure 2-12. Near-site Biological Sampling Points.

Electrofishing in Cattaraugus Creek

Springville dam from the portion of Cattaraugus Creek that is downstream of WNYNSC drainage (BFFCATC). Ten fish samples also are collected annually from Cattaraugus Creek below the dam (BFFCATD), including species that migrate nearly forty miles upstream from Lake Erie. These specimens are representative of sport fishing catches in the creek downstream of the Springville dam.

Twenty control fish are taken every year (ten semiannually) from waters that are not influenced by site runoff (BFFCTRL). These control samples, containing no radioactivity from WVDP effluents, allow comparisons with the concentrations found in fish taken from site-influenced waters. The control species are representative of the several fish species collected in Cattaraugus Creek downstream from the WVDP. A combined total of fifty fish were collected from these locations.

The edible portion of each individual fish was analyzed for strontium-90 content and the gamma-emitting radionuclides cesium-134 and cesium-137. (See Table C-3.4 [p.C3-6 through C3-8] in *Appendix C-3* for a summary of the results.) Throughout the year concentrations of strontium-90 ranged from below the minimum detectable concentration (see *Glossary*) to a maximum of 9.23E-08μCi/g at BFFCATC and from below the minimum detectable concentration to 4.83E-08μCi/g at the control location (BFFCTRL). These levels are very similar to the levels observed in fish collected during 1996. One sport fish caught below the Springville Dam, a steelhead trout, contained 1.28E-07μCi/g of strontium-90. Although this fish contained the highest concentration of strontium-90 among the fish collected from this location in 1997, this value is well within the range of strontium-90 concentrations measured in fish collected from this location before 1997.

Ten fish collected downstream of the site showed marginally positive detections for cesium-137. No cesium-137 concentrations in these fish were statistically different than concentrations measured at the background location.

Venison

Specimens from a near-site deer herd also are analyzed for radioactive components. Historically, concentrations of radioactivity in deer flesh have been very low and Project activities have been shown to have little to no effect on the local herd.

Venison from three deer salvaged from vehicle-deer accidents around the WNYNSC was analyzed and the data compared to that from deer collected far from the site in the towns of Franklinville, Olean, and Burns, New York. Low levels of radioactivity from cesium-137 and naturally occurring potassium-40 were detected in both near-site and control samples.

Concentrations in near-site deer were the same as background levels for these radionuclides in 1997, with the exception of one cesium-137 value, which was within the range of historical control values. The range in concentrations observed was similar to previous years. The shorter-lived cesium-134 isotope was not detected in any near-site or control deer during 1997. Results for these samples are shown in Table C-3.2 (p.C3-4) in *Appendix C-3*. Tritium concentrations in near-site deer were indistinguishable from background. Overall, tritium levels detected in near-site deer and control deer were lower than the 1996 levels.

For the fourth year during the large-game hunting season, hunters were allowed access to the WNYNSC, excluding the WVDP premises, in a controlled hunting program established by NYSERDA. A total of 113 deer were collected. Although hunters were given the option of submitting portions of their takes for testing, none of the deer were analyzed for radioactivity.

Springville Dam on Cattaraugus Creek

A special study of the on-site (WVDP premises) deer population was conducted in 1997 in advance of measures taken to reduce the number of deer inside the security-fenced area. The results of the study are discussed in ***Chapter 4*** under *Environmental Media Concentrations*. (See p. 4-10.)

Beef

In 1997, as in previous years, radiological concentrations in samples of beef from near-site herds were similar to those from control herds.

Beef samples taken semiannually from near-site and remote locations were analyzed for tritium, strontium-90, and gamma-emitting radionuclides such as cesium-134 and cesium-137. Tritium was detected in both near-site and background samples in the second half of 1997, with the near-site result being marginally higher than the background result. During 1997 low positive strontium-90 results were noted in both near-site and background samples. However, near-site and control results were not significantly different. No cesium-134 or cesium-137 was detected at either location in 1997. Results are presented in Table C-3.2 (p.C3-4) in *Appendix C-3*.

Milk

Monthly milk samples were taken in 1997 from dairy farms near the site and from control farms at some distance from the site. (See Fig. 2-12 [p. 2-22].) Quarterly composites of monthly samples from the maximally exposed herd to the north (BFMREED) and from a nearby herd to the northwest (BFMCOBO) were prepared. Single annual samples were taken from herds near the WVDP to the southeast (BFMWIDR) and the south (BFMSCHT). Monthly samples from control herds (BFMCTLN and BFMCTLS) were also prepared as quarterly composites. (See Fig.A-9 in *Appendix A* [p. A-53] for control sample locations.)

Each milk sample was analyzed for strontium-90, iodine-129, gamma-emitting radionuclides (naturally occurring potassium-40, cesium-134, and cesium-137), and tritium. In all cases, radioisotopic concentrations, even when positive, were either within the range of historical background values or statistically overlapped with results from control locations. See Table C-3.1 (p. C3-3).

Fruit, Vegetables, and Forage

Results from the analysis of beans, apples, sweet corn, and hay collected during 1997 are presented in Table C-3.3 (p. C3-5) in *Appendix C-3*. Tritium was not detected in near-site corn and bean samples at levels above background. Although near-site apple samples did show positive tritium results above the control values, results were within the range of control values for other biological matrices.

In 1997 positive strontium-90 results were obtained in all samples. Of these positive results, one near-site apple sample, collected from fruit available to humans but not consumed, indicated strontium-90 at a concentration statistically above the 1997 control value. For a discussion of the dose significance of this elevated value see *Environmental Media Concentrations* in ***Chapter 4***, p. 4-10. The strontium-90 value in near-site corn was statistically higher than the control sample but below other matrix control sample concentrations (e.g., beans and apples). The concentration of strontium-90 in near-site hay in 1997 was statistically higher than the control value but below the value reported for the near-site hay sample in 1996. Cesium-137 was not detected in any fruits, vegetables, or hay.

Direct Environmental Radiation Monitoring

The current monitoring year, 1997, was the fourteenth full year in which direct penetrating radia-

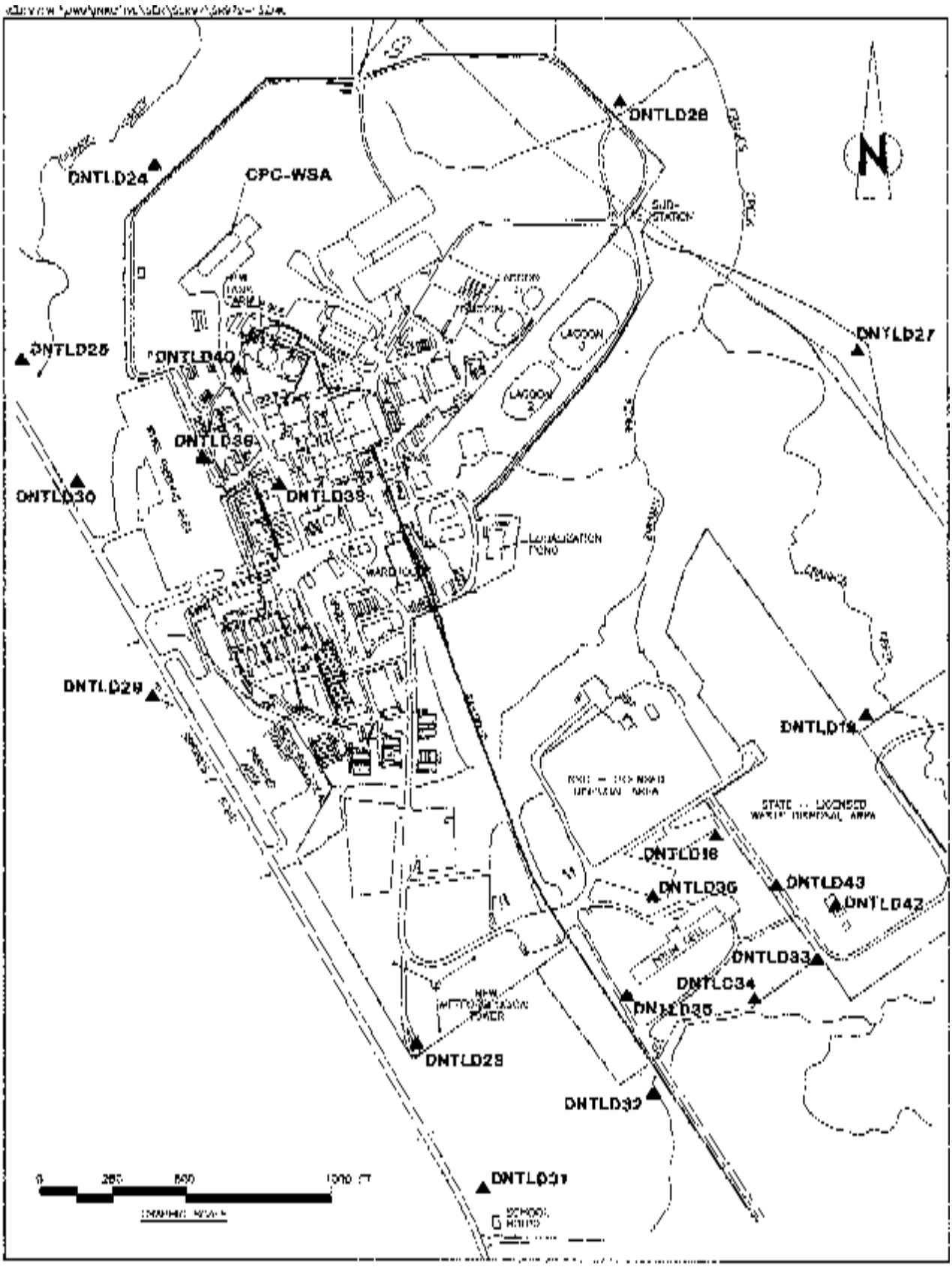

Figure 2-13. Location of On-site Thermoluminescent Dosimeters (TLDs).

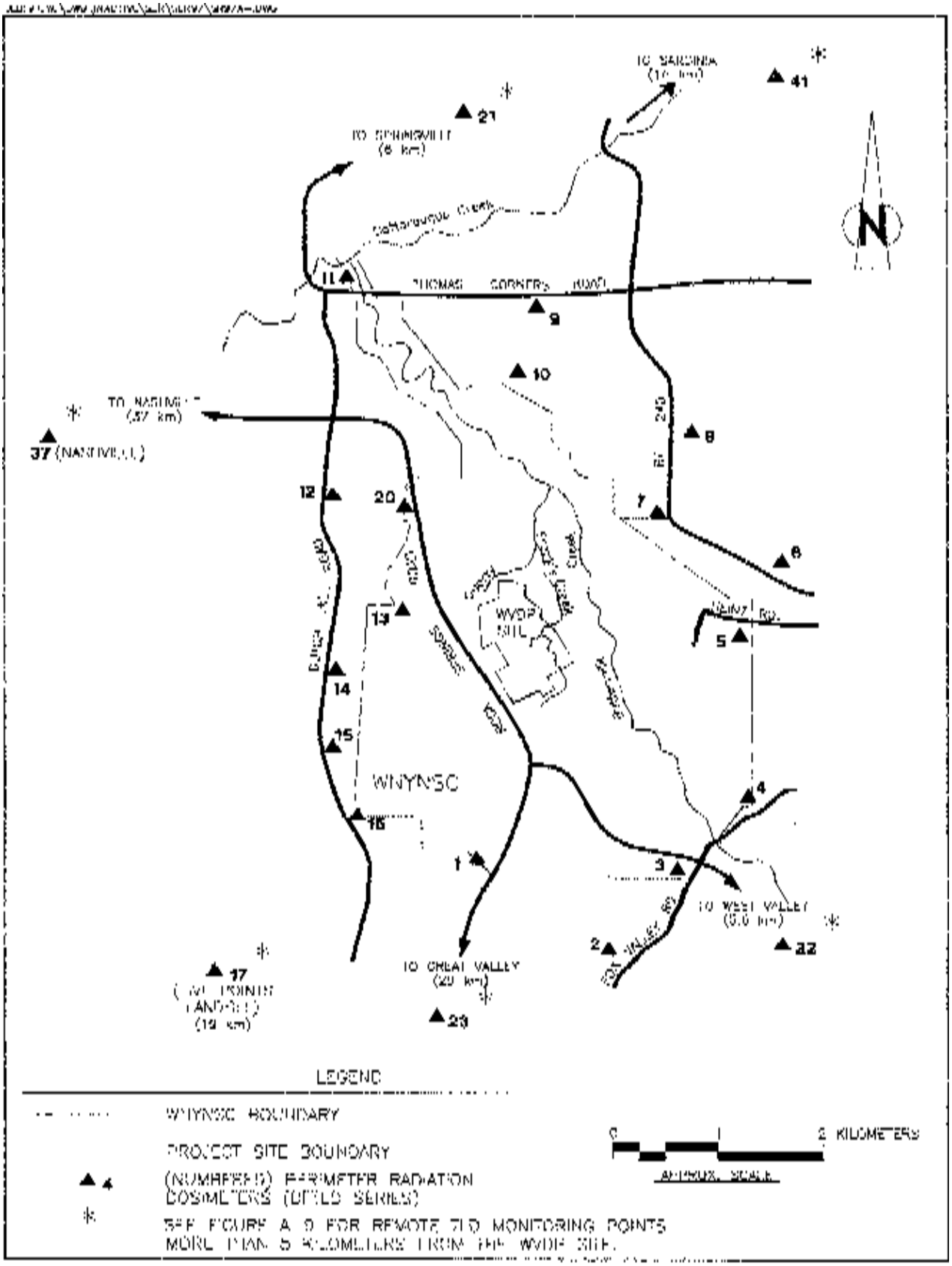

Figure 2-14. Location of Off-site Thermoluminescent Dosimeters (TLDs).

tion was monitored at the WVDP using TLD-700 lithium fluoride thermoluminescent dosimeters (TLDs). These dosimeters, used solely for environmental monitoring, consist of five TLD chips laminated on a card bearing the location identification and other information. The cards are placed at each monitoring location for one calendar quarter (three months) and are then processed to obtain the integrated gamma radiation exposure.

During the third and fourth quarters of 1997 two sets of TLD chips were placed at each monitoring location. The original TLD-700 dosimeters were accompanied by new, copper-activated lithium fluoride dosimeters, and studies are being conducted at the WVDP and the Idaho National Environmental Engineering Laboratory to determine the suitability of the new matrix. The new chips are reportedly more sensitive to environmental radiation. When a sufficient evaluation has been completed the new chips will replace the TLD-700 dosimeters entirely.

This was the second full year in which TLD packages were processed by an independent off-site contractor. (See *Appendix C-4*, Tables C-4.1 and C-4.2 [pp. C4-3 and C4-4]). Calendar year 1997 was the final year in which the NRC co-located environmental TLDs at the WVDP. The three on-site NRC monitoring locations were removed in January 1998.

Monitoring points are located around the WNYNSC perimeter and the access road, at the waste management units, at the site security fence, and at background locations remote from the WVDP site (Figs. 2-13 and 2-14 [pp. 2-26 and 2-27] and Fig. A-9 [p. A-53]). The identification numbers of the TLDs were assigned in the chronological order of TLD installation. The monitoring locations are as follows:

THE PERIMETER OF THE WNYNSC: TLDs #1-16, #20

THE PERIMETER OF THE SITE SECURITY FENCE: TLDs #24, #26-34

ON-SITE SOURCES OR SOLID WASTE MANAGEMENT UNITS: TLDs #18, #32-36, and #43 (RTS drum cell); #18, #19, #33, #42, and #43 (SDA); #24 (component storage, near the WVDP site security fence); #25 (the maximum measured exposure rate at the closest point of public access); #38 (main plant and the previous cement solidification system); #39 (parking lot security fence closest to the vitrification facility); #40 (high-level waste tank farm)

NEAR-SITE COMMUNITIES: TLDs #21 (Springville); #22 (West Valley)

BACKGROUND: TLDs #17 (Five Points Landfill in Mansfield); #23 (Great Valley); #37 (Nashville); #41 (Sardinia).

Measured exposure rates were comparable to those of 1996. There was no significant difference between the pooled quarterly average background TLDs (#17, #23, #37, and #41) and the pooled average for the WNYNSC perimeter locations for the 1997 reporting period.

Tables C-4.1 and C-4.2 (pp. C4-3 through C4-4) provide a summary of the results by calendar quarter for each of the environmental monitoring locations along with averages for comparison. The individual location results show different quarterly results because of seasonal variations. The data obtained for all four calendar quarters compared favorably to the respective quarterly data in 1996. The quarterly average of the seventeen WNYNSC perimeter TLDs was 18.5 milliroentgen (mR) per quarter (17.7 mrem per quarter) in 1997.

The perimeter TLD quarterly averages since 1985, expressed in microroentgen per hour (μR/hr), are shown in Figure 2-15 below.

On-Site Radiation Monitoring

Location #24 on the north inner facility fence was a co-location site in 1997 for one NRC TLD. (See *Appendix D*, Table D-4 [p. D-10].) Valid WVDP data from the fourth quarter of 1997 for location #24 are not available because of a problem with the chip analysis instrument. The average exposure rate at location #24 for the first three quarters, however, was about 0.31 milliroentgens (mR) per hour during 1997, as opposed to 0.38 mR/hr in 1996, 0.39 mR/hr in 1995, 0.47 mR/hr in 1994, 0.48 mR/hr in 1993, and 0.52 mR/hr in 1992. Sealed containers of radioactive components and debris from the plant decontamination work are stored nearby. The decline in exposure rate over time is due to radioactive decay of the materials stored within. The storage area is well within the WNYNSC boundary, just outside of the WVDP fenced area, and is not accessible by the public.

Locations around the integrated radwaste treatment storage building — the drum cell — for the most part stayed the same or decreased slightly during the 1997 calendar year. The average dose rate at TLDs #18, #32, #33, #34, #35, #36, and #43 was 0.019 mR/hr in 1997, slightly lower than the level observed in 1996. These exposure rates, which are above background levels, reflect the placement in the building of drums containing decontaminated supernatant mixed with cement. The drum cell and the surrounding TLD locations are well within the WNYNSC boundary and are not accessible by the public.

Results from locations #27, #28, and #31 at the security fence are near background. These locations are more distant from on-site radioactive waste storage areas. The TLD measurements at the Rock Springs Road location (TLDs #28 and #31) are presented in *Appendix C-4*, Table C-4.2 (p. C4-4). The most recent data show that expo-

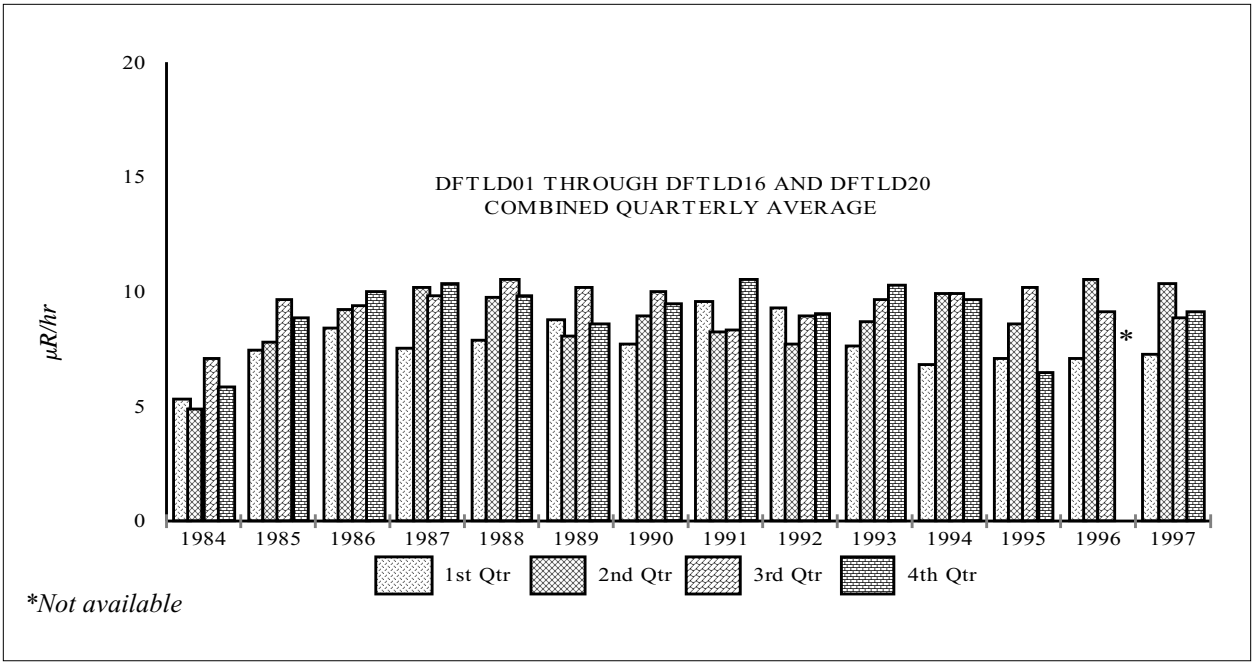

Figure 2-15. Fourteen-Year Trend of Environmental Radiation Levels

Checking Data from the Meteorological Tower

sure rates at Rock Springs Road are the same as or only slightly greater than those seen before any drums were placed in the drum cell.

Results for TLD #42 are above background, reflecting its location close to a waste tank that stores SDA leachate.

Perimeter and Off-site Radiation Monitoring

The perimeter TLDs (TLDs #1-16 and #20) are located in the sixteen compass sectors around the facility near the WNYNSC boundary. The quarterly values for these TLDs (Fig. 2-15 [p. 2-29]) indicate no trends other than normal seasonal fluctuations. TLDs #17, #21-23, #37, and #41 monitor near-site community and background locations. The results from these monitoring points are essentially the same as the perimeter TLDs. Figure C-4.1 in *Appendix C-4* (p. C4-6) shows the average quarterly exposure rate at each off-site TLD location. Figure C-4.2 (p. C4-6) shows the average quarterly exposure rate at each on-site TLD.

Note: In addition to location #24, WVDP fourth-quarter 1997 data are unavailable for locations #17 through #23. All eight of the affected TLD chips were being read by the same analyzer when the instrument problem was encountered. Consequently, fourth-quarter 1997 data for these locations are not presented.

Confirmation of Results

The performance of the environmental TLDs is confirmed periodically using a portable high-pressure ion chamber (HPIC) detection system. In August 1997 the HPIC was transported to each of the forty-three environmental TLD locations and ten instantaneous dose readings were obtained. The ten readings were averaged to determine the dose rate (in μR/hr) at each location. The TLD results and HPIC readings showed very good correlations at forty-one of the forty-three locations. Two locations showing greater variability (locations #24 and #40) are near active waste management areas and would be expected to change during the study period. Results of this study are provided in *Appendix C-4*, Table C-4.3 (p.C4-5).

Meteorological Monitoring

Meteorological monitoring at the WVDP provides representative and verifiable data that characterize the local and regional climatology of the site. These data are used primarily to assess potential effects of routine and nonroutine releases

of airborne radioactive materials and dispersion models used to calculate the effective dose equivalent to off-site residents.

Since dispersive capabilities of the atmosphere are dependent upon wind speed, wind direction, and atmospheric stability (which is a function indicated by the difference in temperature between the 10-meter and 60-meter elevations), these parameters are closely monitored and are available to the emergency response organization at the WVDP.

The on-site 60-meter meteorological tower (Fig. 2-1 [p. 2-4]) continuously monitors wind speed and wind direction. Temperatures are measured at both 60-meter and 10-meter elevations. In addition, an independent, remote 10-meter meteorological station located approximately 8 kilometers south of the site on a hillcrest on Dutch Hill Road continuously monitors wind speed and wind direction. (See Fig. A-9 [p. A-53].) Dewpoint, precipitation, and barometric pressure are also monitored at the on-site meteorological tower.

The two meteorological locations supply data to the primary digital and analog data acquisition systems located within the Environmental Laboratory. On-site systems are provided with either uninterruptible or standby power backup in case of site power failures. In 1997 the on-site system data recovery rate (time valid data were logged versus total elapsed time) was approximately 96.3%. Figures C-6.1 and C-6.2 in *Appendix C-6 (*pp. C6-3 and C6-4) illustrate 1997 mean wind speed and wind direction at the 10-meter and 60-meter elevations. Regional data at the 10-meter elevation are shown in Figure C-6.3 (p.C6-5).

Weekly and cumulative total precipitation data are illustrated in Figures C-6.4 and C-6.5 in *Appendix C-6* (p. C6-6). Precipitation in 1997 was approximately 109.8 centimeters (43.2 in), 5.6% above the annual average of 104 centimeters (41 in).

Information such as meteorological system calibration records, site log books, and analog strip charts are stored in protected archives. Electronic files containing meteorological data are copied (downloaded) weekly and stored off-site. Meteorological towers and instruments are examined three times per week for proper function and are calibrated semiannually and/or whenever instrument maintenance might affect calibration.

Special Monitoring

Investigation of Increased Iodine Emissions from the Main Stack

The start of radioactive vitrification operations resulted in an increase in the emission rate of radioactive isotopes of iodine from the main plant stack. The reason for the increase is that gaseous iodine is not as efficiently removed by the vitrification process off-gas treatment system as are most of the other radionuclides. (For more information on the off-site effective dose from airborne emissions see ***Chapter 4, Radiological Dose Assessment***, p. 4-10.)

Iodine-129 emissions from the main stack increased in 1996 and continued at elevated levels in 1997. Iodine-129 is a long-lived radionuclide that has always been present in main stack emissions. In addition, iodine-131 was detected in 1996. Iodine-131, an isotope with a half-life of eight days, originates from the decay of curium-244. Curium-244 is present in the high-level waste. Iodine-131 was not detectable until vitrification processing began because the pre-vitrification storage and management of the high-level waste had prevented detectable levels of iodine-131 from reaching the air effluent. The process of preparing the high-level waste for vitrification increased quantities of iodine-129 and allowed a very small yet detectable quantity of iodine-131 to be released to the

main plant stack air effluent through the vitrification process off-gas treatment system.

Iodine-129 was closely monitored throughout 1997 and the results compared to process operations in the vitrification facility. Fluctuations in iodine-129 concentrations were too small to determine which specific process was the primary transport mechanism, although the release levels were within the anticipated range. The relevant data are shown in Table C-2.1, *Appendix C-2*, p. C2-3.

Closed Landfill Maintenance

Closure of the on-site nonradioactive construction and demolition debris landfill (CDDL) was completed in August 1986. The landfill area was closed in accordance with the New York State Department of Environmental Conservation (NYSDEC) requirements for this type of landfill, following a closure plan (Standish 1985) approved by NYSDEC. To meet routine post-closure requirements, the CDDL cover was inspected twice in 1997 and was found to be in generally good condition. Routine minor repairs are made to maintain an adequate grass cover, and the grass planted on the clay and soil cap is cut. Adequate drainage is maintained to ensure that no obvious ponding or soil erosion occurs. Results of groundwater monitoring in the general area of the closed landfill, i.e., wells 803 and 8612, are presented in ***Chapter 3, Groundwater Monitoring***, p. 3-15.

WNNDADR Tritium Sampling

As noted in previous reports, tritium has been detected at this location at various concentrations. To understand whether these concentrations are affected solely by seasonal variations or by some other influence, water samples were collected and analyzed weekly during 1997. The average monthly tritium concentration at this location was determined to be 1.93E-06μCi/mL. The highest weekly concentration was recorded in late July at 5.07E-06μCi/mL (0.25% of the DCG). In general, the tritium concentration is more evident during periods of low surface and groundwater flow such as during the summer months.

Low-level Waste Treatment Facility Investigation

The WVDP treats low-level radioactive wastewater at the low-level waste treatment facility (LLWTF) before it is discharged via the lagoon system and SPDES-permitted outfall WNSP001. Sources of wastewater treated by this system include drains in the main plant, process wastewater, groundwater from the NDA interceptor trench, and wastewater from the high-level waste tank farm vault.

A sampling and analysis plan was prepared to evaluate whether certain site-specific metals and other pollutants existed in the wastewater and to determine the removal efficiency of the various wastewater treatment systems in use at the LLWTF. The selected pollutants are listed in the EPA Form 2C table. Although the LLWTF was not designed to specifically remove these constituents from the wastewater, it was expected that some removal would occur. The sampling plan addressed both the untreated wastewater influent and the treated LLWTF effluent.

Sampling of the LLWTF effluent indicated that the highest removal was observed for strontium-90 (99.7%) and cesium-137 (96.4%). Seven metals — aluminum, barium, iron, magnesium, manganese, mercury, and titanium — were regularly detected above their respective method detection limits (MDLs). The remaining metals were either not detected or were sporadically detected above their respective MDLs. Removal of barium,

iron, magnesium, manganese, mercury, and titanium ranged from 41% to 80%.

Nonradiological Monitoring

Air Monitoring

Nonradiological air emissions and plant effluents are permitted under NYSDEC and EPA regulations. The regulations that apply to the WVDP are listed in Table B-2 (p. B-4) in *Appendix B*. The individual air permits (certificates to operate) held by the WVDP are identified and described in Table B-3 (pp. B-5 through B-7).

The nonradiological air permits are for emissions of regulated pollutants that include particulates, ammonia, and nitric acid mist. Emissions of oxides of nitrogen and sulfur are each limited to 100 tons per year and are reported to NYSDEC every quarter. Nitrogen oxides emissions for 1997 were approximately 14 tons; sulfur dioxide emissions were approximately 0.66 tons.

Although monitoring of these parameters currently is not required, the WVDP has developed an opacity observation program: If nitrogen oxides (NO_x) are emitted at sufficient concentrations, the air discharged from the main stack will take on a yellow-brown color. The intensity of this color (opacity) is in proportion to NO_x concentration. In order to be capable of assessing and documenting such potential emissions, selected staff environmental scientists and engineers completed a New York State-certified opacity observation training course.

The vitrification off-gas treatment system is equipped with a nitrogen oxides abatement and monitoring system. A relative accuracy test audit performed by the WVDP and witnessed by NYSDEC on April 22, 1997, measured a 5.2% accuracy, well within the 20% standard.

Surface Water Monitoring

Liquid discharges are regulated under the State Pollutant Discharge Elimination System (SPDES). The WVDP holds a SPDES permit that identifies the outfalls where liquid effluents are released to Erdman Brook (Fig. 2-16 [p. 2-34]) and specifies the sampling and analytical requirements for each outfall. This permit was modified in 1990 to include additional monitoring requirements at outfall WNSP001. The WVDP applied for a renewed SPDES permit in 1991. It was received in early January 1994 and went into effect on February 1, 1994 with the expanded monitoring requirements and, in some cases, more stringent discharge limitations. The permit was modified in April, November, and December 1994 and in June 1995. Four outfalls are identified in the 1995 permit:

- outfall WNSP001, discharge from the low-level waste treatment facility

- outfall WNSP007, discharge from the sanitary and industrial wastewater treatment facility

- outfall WNSP008, groundwater effluent from the perimeter of the low-level waste treatment facility storage lagoons.

- outfall 116, a sampling location in Frank's Creek that represents the confluence of outfalls 001, 007, and 008 as well as storm water runoff, groundwater surface seepage, and augmentation water. Samples from upstream sources (outfalls 001, 007, and 008) are used to calculate total dissolved solids at this location and demonstrate compliance with the SPDES permit limit for this parameter. (Outfall 116 is referred to as a "pseudo-monitoring" point on the SPDES permit. See *Glossary,* p. 6.)

The conditions and requirements of the current SPDES permit are summarized in Table C-5.1 (pp. C5-3 through C5-4) in *Appendix C-5*.

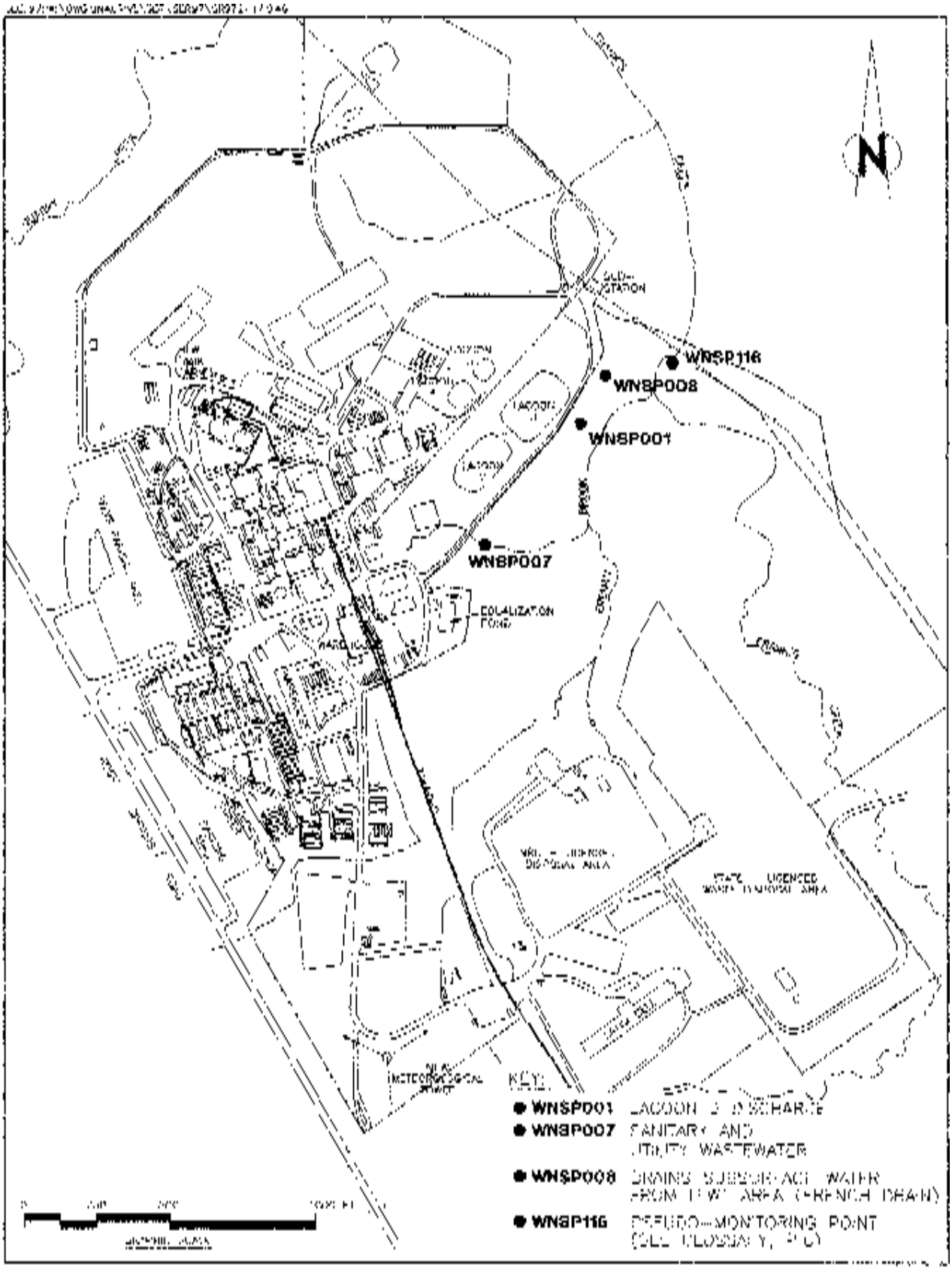

Figure 2–16. SPDES Monitoring Points.

Some of the more significant features of the SPDES permit are the requirements to report five-day biochemical oxygen demand (BOD-5), total dissolved solids, iron, and ammonia data as flow-weighted concentrations and to apply a net discharge limit for iron. The net limit allows the Project to account for amounts of iron that are naturally present in the site's incoming water. The flow-weighted limits apply to the flow-proportioned sum of the Project effluents.

The SPDES monitoring data for 1997 are displayed in Tables C-5.3A through C-5.8 in *Appendix C-5* (pp. C5-6 through C5-16). The WVDP reported five permit exceedances in 1997 (Table C-5.2 [p. C5-5]). See the ***Environmental Compliance Summary: Calendar Year 1997*** (pp.liii through liv).

Semiannual grab samples at locations WNSP006 (Frank's Creek at the security fence), WNSWAMP (northeast swamp drainage), WNSW74A (north swamp drainage), and WFBCBKG (Buttermilk Creek at Fox Valley) were taken in 1997. These samples are screened for organic constituents and selected anions, cations, and metals. Results of these measurements for all of these locations are found in Table C-1.27 (p. C1-21) in *Appendix C-1*.

Results of sampling for nonpurgeable organic carbon (NPOC) and total organic halogens (TOX) at two locations that help monitor the NDA, WNNDADR and WNNDATR, are found in Tables C-1.19 and C-1.20 (pp. C1-15 and C1-16). (See Fig. 2-3 [p. 2-6].) Although values from both locations are routinely higher than those from the background location WFBCBKG and have, on occasion, fluctuated upward, there are no data to suggest that these higher levels are the result of releases from the surrounding waste management units.

Drinking Water Monitoring

The site's drinking water is monitored to verify compliance with EPA and NYSDOH regulations. (See *Safe Drinking Water Act* in the ***Environmental Compliance Summary: Calendar Year 1997*** [p. lvi].)

Samples are collected annually for nitrate, fluoride, and metals concentrations analyses. Sampling and analysis for copper and lead are conducted according to Cattaraugus County Health Department guidance. In 1997 monitoring results indicated that the Project's drinking water met NYSDOH, EPA, and Cattaraugus County Health Department drinking water quality standards.